# MUNICIPAL ENGINEERING

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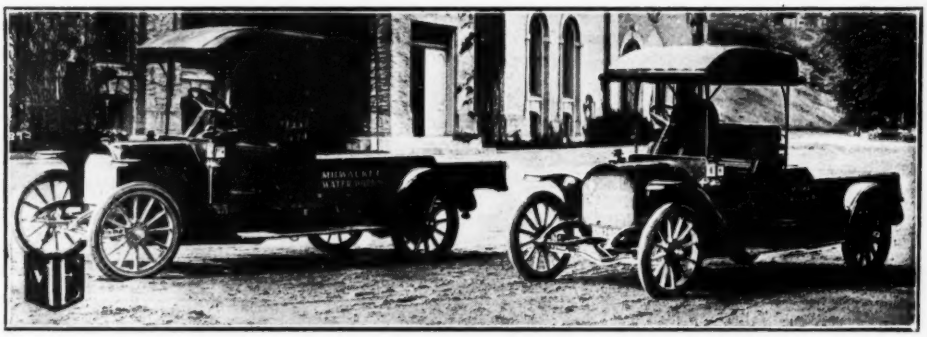

AUTOMOBILES IN THE MILWAUKEE WATER WORKS DEPARTMENT.

VOL. XLVIII. MARCH, 1915. NO. 3.

*The engineer's code of ethics can be comprised in a single sentence like this: "Act as a gentleman in every respect on all occasions; be just and generous to your brothers in the profession and do not hesitate to take the full responsibility for all your actions."*—W. HILDENBRAND.

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# THE JITNEY BUS

## A NEW PROBLEM IN TRAFFIC REGULATION.

**By Frank Reed, Los Angeles, Cal.**

*The jitney bus has spread like wild-fire over the country during the past six months and has become a serious problem in street traffic regulation, a nuisance at the same time that it gives a large measure of benefit to the patient strap-hanger who now, sometimes, can get a seat and make better time all at once. Probably the acute stage will be passed as times improve and other employment offers and as old cars wear out and their owners have not been able to make enough to buy others, but evidently there is a permanent use for the jitneys under some conditions in some places and at some times of day, the times of greatest congestion in street traffic. The problem of regulation will therefore not be so serious as it appears at this time. Up to the date of going to press no regulating laws or ordinances have actually been passed and put into force.*

THE "jitney bus" is a contagious municipal affliction now in violent eruption on the streets of a constantly increasing number of cities. Its symptoms are well defined. First is the appearance of a rapidly increasing number of heterogeneous motor vehicles, usually worn or second-hand, and of the low-priced pleasure-car type, driven by men with an unkempt and worried appearance, who, by their activities, soon come to be known as "nickel chasers." The term "jitney" is slang for five cents, the price of a ride.

The next symptom is frequent irresponsible driving, an outgrowth of competition with one another, and with street cars, and a tendency to be careless of the rights and privileges in the streets of pedestrians, particularly persons intending to board electric railway cars. This recklessness and frequent defective condition of automobile equipment or ignorance of driving, together with traffic congestion, result in a notable increase of street accidents due to contacts between vehicles and pedestrians, or between vehicles and stationary objects or other vehicles.

The third stage is protest by the established electric railway companies against the "irresponsible and unregulated competition" of the jitney motor transportation, which, with all its defects, appeals to a very considerable riding public. Then comes the laying off of cars and curtailment of service on certain lines most affected by the jitney bus competition.

The next stage is active newspaper publicity and general public discussion of the good and ill aspects of jitney bus transportation, resulting in a demand for regulation. By this time the jitney bus drivers are formed into an organization and issues become fairly well defined, but bitterly contested, making regulation without precedents a difficult problem.

Los Angeles has been doing the heavy pioneering in working toward a solution of the jitney bus problem. The jitney bus originated in Phoenix, and was a good thing there, operating on streets not covered by electric railway service. Next it was heard of in Long Beach, where, in certain sections of the city, it supplemented with a needed transportation service the existing electric railway service, and then it was discovered that a $5 a month license would turn over to the

TYPICAL JITNEY BUS *in use in Los Angeles, with sign. Note length of route.*

driver of a pleasure car in Los Angeles the privilege of peddling transportation, or soliciting riders, and operating between the heart of the business district and the principal residential sections along the level asphalt boulevards. There was a rush stimulated by lack of employment of automobile owners who had previously been working as salesmen, solicitors, collectors, etc., and also by the heavy number of cars in the second-hand market in a city where an average of one family in every five is an automobile owner.

The automobile dealers declare the jitney bus is a business anomaly—a business failure that is bound to stay. It is a business failure because only rarely can the operator peddle enough rides in a day to pay the operating and repair costs of his car, make an adequate allowance for the depreciation of the vehicle and pay himself a reasonable living wage on a 5-cent fare. The drivers, speaking generally, admit this themselves. What they are really doing is selling the residue value in old cars to the public in nickel installments, living on their cars, if they are their own, or making a bare living above the installments on the cars if they are bought on time from a second-hand dealer, until they can get some kind of a steady job. The men in the automobile trade point out that this kind of people and this kind of cars and conditions will be found in some cities all the time, and that as fast as one goes out of the jitney business his place will be taken by another. Of course the railways, being most hurt, are making the loudest protest. Unemployment of their men is created about as fast as employment is acquired by others in the jitney business.

The jitney drivers do not give a predetermined and regular service, either as to route or time schedule. It is urged that this will affect real estate values unfavorably.

The appearance of the jitney bus traffic in the business district produces an unfavorable impression on the average onlooker, which has led to objection by leading retail stores and hotels, and other business men. The street congestion is inconvenient and frequently dangerous to pedestrians at crossings, and to drivers of automobiles engaged in what automobile dealers and owners call legitimate use of the machine.

Jitney drivers early discovered that the money was in the overload, and the machines are crowded to a degree which can only be compared to the Brooklyn bridge crush in the old days. Little extra seats of board are installed in tonneaus, and in the rush hours passengers ride on the

doors and the running boards. Twelve in a five-passenger Ford is no uncommon sight; a situation which has led to discussion of the need of regulation on social grounds.

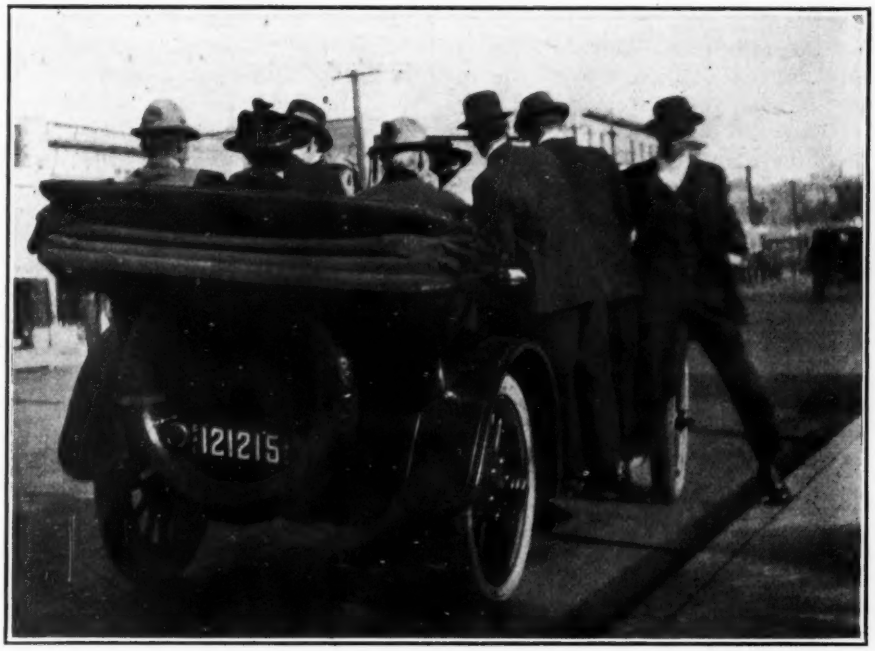
Congestion in the downtown blocks of the principal business streets is augmented by the establishment of safety zones at car-boarding points, which were rendered absolutely necessary by this new traffic. There is a general impression that the limit of street efficiency is exceeded by the addition of the jitney, of which over a thousand are now licensed in Los Angeles.

On the other hand, the jitney is being used by some thousands of passengers daily. Many of these are picked up in a moment of indecision by an alert nickel chaser, who drives up to the curb as they are waiting for a street car, opens his door and, as it were, scoops them into his car. Many others ride by choice. The chief attractions of the service are that it is a ride in an automobile with upholstered seats on automobile springs above rubber tires over smooth asphalt pavement; that the jitney acquires its load quickly, and most of the people unload near together, and there are comparatively few passengers per car anyway, so it gives an express service as compared with the frequent pick-up and let-down stops of the electric railway cars. Jitneys give fifteen minutes from some outlying districts, as against thirty for the electric car. Even when the tonneau is crowded there is some kind of a thing to sit on or lean upon for everybody, and as to the crowding, it is sufficient to remark that some people like a rough-house time anyway. So it appears that, however much electric railway people dislike it, the problem which confronts a municipality when the jitney comes is not one of elimination, or absolute suppression, but of regulation.

Probably the first consideration is that of street efficiency. This is tied up more or less with the question of what is a safe load for a jitney, and this in turn is rendered doubtful by the variety of types of vehicle. Light motor trucks, with bodies having a seating capacity of ten or fourteen pasengers, are coming into use to some extent, and pay better returns than other types.

The present tendency in regulation thought seems to be to permit but one

TAKING THE LAST WEAR *out of an old automobile by using it as a picker-up of transportation nickels.*




rider with the driver on the front seat, no riding on the running board, and to limit the load in the tonneau to two above its seating capacity.

Results of a brief study of traffic efficiency, under electric and jitney transportation, respectively, of the high-class business block in which the heaviest congestion occurs in Los Angeles, on Broadway between Sixth and Seventh streets, supply the following data: The length of the block, including crossings from outside of curbs, is 612 feet, width 56 feet from curb to curb. It is traversed lengthwise by double electric car tracks; electric cars cross at Sixth street and at Seventh, and there is a double track turn-off on some of the heaviest lines in town from Broadway to West Seventh. Safety zones are established by portable sign stands at the car-stop end of the block on each side, leaving room for one automobile to pass between the safety zone and the sidewalk.

During a heavy rush hour for all kinds of traffic, the street is packed full of automobiles and electric cars, with the congestion piling up and extending behind. Figures which show the reason for this and give a basis for comparison with

IT IS THE OVERLOAD *which seems to bring the profit, but excessive wear and breakages will soon tell a different tale.*

figures which may be obtained in other cities, so that an estimate of the effect of a given district, are as follows:

Center entrance cars seating 50 are 46 introducing jitney bus traffic, may be made from a consideration of the street space and persons traveling to and from feet 7 inches long by 8 feet 5½ inches wide. Pay-as-you-enter cars seating 42 are 2 feet shorter. Figuring on the comfortable standing capacity, at the ratio of 66 seats per 100 passengers, determined as reasonable for the rush hour in a noted decision of the Wisconsin Railroad Commission, these cars should carry 75 and 63 passengers respectively in the rush hours. Twelve of the larger cars, the capacity of one track in the block, would load 792 passengers. Allowing longitudinal street space of 13½ feet for a Ford jitney, and figuring 7 passengers to the vehicle, not including the driver, the block full of jitneys, on one side in a single string, would load 45 with 315 passengers. As the jitneys are inter-

spersed with privately operated automobiles, the paid traffic transportation cacapity load of a block for electric car traffic is somewhere around four times the efficiency of the block for jitney traffic. If the jitneys were left to carry the traffic alone, they would smother one another out of business, or compel the building of subways.

The street railway companies insist that they cannot continue to operate if the jitneys are to skim the cream, that is, the rush hour and best route traffic, which makes up for the long empty hauls which regulatory ordinances force upon the electric cars.

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¶ THE CONGESTION OF TRAFFIC *is measured by the actual count of vehicles now necessary to carry the crowds and of capacity of the autos commonly used as jitneys.*

November 27, 1914, a traffic count at Seventh and Broadway, from 5 p. m. to 6:30 p. m., showed 345 cars passing that corner. Vehicles of all kinds, 1,533. Passengers on electric railway cars going out of town, 8,227. Cars going out of town, 191. Average load per car, 43. To transport the passengers carried by the cars would require 1,177 Ford automobiles carrying 7 passengers per auto, not including the driver. Allowing street space of 13½ feet per vehicle, which is 2 feet in excess of actual space covered, would make a string 3 miles long. Constant operation would require an incoming string of machines 3 miles long to keep up the procession, after the first 3 miles had loaded and passed out of town. To carry out of the city all the people the electric railway transports, in Fords at 7 per car, would make a line of jitney busses between 35 and 40 miles in length going, and an equal line coming. The railway does this with 17 miles of cars.

The effect on safety of street travel produced by the introduction of the jitney bus is indicated by statistics of accidents in Los Angeles, which show a sharp increase coincident with the development of this new type of transportation. Street accidents had been running slightly less than 400 per month in July, August and September. In October the jitneys began to appear, and street accidents ran up to 463. In November, new jitneys were going on every day, until, at the end of the month, there were about 700 operating, and accidents showed a cumulative increase through the month to a total of 601. The first eight days of December there were 8 accidents per day traceable entirely to jitneys. In the period November 17 to 28, out of 280 total accidents, there were 111 due to jitneys, which were only 3 per cent. of total vehicles. Accidents averaged 14.9 per day in October, and 23.3 per day in the last two weeks of November, with jitneys involved in 26 per cent. of the total.

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¶ STREET ACCIDENTS *are greatly increased by the increase in traffic, the competition for passengers and irresponsible drivers.*

Lieutenant Butler, of the police traffic department, in his official report attributes this definitely to "incompetence or recklessness or both in a large percentage of drivers," and suggests rigid examination of drivers, prohibition of riding on running boards, and limiting of operations to a stated route.

Control of the jitneys by the State Railroad Commission is advocated in some quarters. Such control, under the existing public utility laws, would require them to file and operate on definite schedules and routes, and they might start operations only after proving that public convenience and necessity required them to operate over a contemplated route.

In Los Angeles the mayor covers the situation by advocating an ordinance which would take the jitneys out of the four main streets in the down-town business section, thru the congested blocks, leaving them to operate on the parallel streets immediately outside. He says they should be required to have definite starting and stopping points, and to make the full run every trip. Loading and unloading points should be apart from street car regulation stops. Rigid examination of applicants for license, license fee in

proportion to gross receipts, power to revoke the license for reckless driving and violation of traffic regulations, requirement that each auto bus take out from an insurance company of established reliability an indemnity bond of not less than $10,000, and that overloading should be strictly prohibited, are further measures advocated. The mayor refers to reports of Traffic Officer Butler, citing accident figures already quoted, and also to the warning of Fire Chief Eley, issued after his equipment had been delayed on the way to fires by jitney bus congestion.

Business men have petitioned the city council for a regulating ordinance, including fees of $60 a year for five-passenger cars up to $100 a year for fifteen or more capacity.

The entire situation is a new and exceedingly vital problem affecting municipal activities in several lines and public welfare, as well as the welfare of established public utilities which are heavy contributors to municipal and state revenues. The experience so far may be summed up in two principal conclusions. Operation of the jitney busses shows urgent need of careful and effective regulation, and further it has proved that automobiles cannot be operated with profit on a business basis in a general passenger transportation scheme on a flat five-cent fare, even without transfers.

## [EDITOR'S NOTE.]

The above article may be supplemented by a digest of the newspaper reports from other cities showing the popularity of the jitney bus, its apparent business impossibility, and, at the same time, its success, which is probably but temporary.

Not including such attempts to establish regular routes for auto-bus lines, successful or unsuccessful, as have been noted in MUNICIPAL ENGINEERING from time to time, in New York City, where they succeeded the old Fifth avenue horse-drawn stages, Washington, Pittsburg, Indianapolis, Huntington, Ind., Los Angeles, Detroit and elsewhere, the first real jitney bus seems to have been started in Phoenix, Ariz., during a strike in 1913. It was followed in 1914 at Long Beach, a seaside resort of Los Angeles, and in October, 1914, by Los Angeles itself, as described by Mr. Reed, which city, by latest reports, has over 1,000 jitney busses in operation, taking in about $8,500 a day. The street railway company has petitioned the city council of Long Beach for permission to abandon about four miles of street car lines, which, it claims, do not pay in competition with the jitneys. The company has taken off about 40 cars from Los Angeles lines because of the reduction in traffic.

The street railways in Monterey and Pacific Grove, Cal., are reported to have been forced to the wall. Other cities followed rapidly, particularly on the Pacific Coast.

Houston, Tex., began about the middle of December and has developed over 200 cars, which have been taking $1,000 a day out of street railway fares, with an increase in number of accidents. Autos pay $1 license fee and file $100 bond to comply with city ordinances. The Jitney Association is trying to work out a regulating ordinance, in co-operation with the city council.

Seattle began a little later and now has over 500 autos in service, some of which run all night, with 10-cent fare after midnight. The Seattle Auto Transit Association has 300 members and has retained counsel to protect its interests in the Legislature. Autos pay $2 state tax and $4 city vehicle license. The State Public Service Commission recently decided that they are common carriers and subject to regulation by the commission.

San Francisco began early in January, now has over 1,000 cars in operation and expects 2,000 when the exposition traffic is developed. Regulations by city ordinance, by legislative act and by the State Railroad Commission are all in process. Oakland has 450 jitneys and an association of owners.

Fort Worth formed the Auto Transit Company about the middle of January, operating 30 cars, and individuals have

brought the number up to 141, paying no tax or license.

Kansas City began a few days later and has more than 100 in service on 27 routes, with service on some up to midnight. There are a few motor trucks in the service crudely equipped to carry 30 to 50 passengers. There is an association which is trying to develop routes and assignments to them.

In Birmingham, Ala., the first jitneys were started by a large auto dealer to put second-hand cars in use. Others have followed. Drivers report that a second auto on a route improves the traffic by giving better service, but a third makes it hard for all three to get enough to live on a line with a limited amount of traffic.

Ogden, Utah, has the Jitney Service Company, with $25,000 capital stock, and three lines.

The first jitney bus in Peoria, Ill., started February 8 and on the 10th rather short routes were in operation along three principal street car lines, and four cars were running to East Peoria. One of the city aldermen is in the firm starting the first lines with seven cars, and will try some long lines, possibly supplying larger cars, as small autos cannot pay on long lines. The taxicab company figures a loss on 5-cent fares and will not start lines. It figures 12 cents a mile for tires and gasoline on a 3,000-pound car, chauffeur's wages, deterioration, interest, license fee, oil, repairs and liability insurance, and demonstrates its contention. The jitney bus pays the regular hack license of the city.

St. Louis has a Motor Service Company which had 11 automobiles in the jitney service February 13 and added an auto truck carrying 30 passengers on that day. The jitneys carry about 2,000 passengers a day. The service of the company is increasing daily and 25 autos are probably in use by the time this number of MUNICIPAL ENGINEERING is issued. Some of them run only in the rush hours, morning and evening. The regular lines are comparatively short, 15 to 20 minutes time being required to cover them. A 10-cent line to the Art Museum was started February 14 to run until 8 p. m. with ten cars, two of which broke down the first Sunday, and the line carried 600 passengers during the day.

Omaha is reported to have started 10 routes on February 1.

Maryville, Mo., is a small city with a single jitney bus.

Conway, Ark., has one auto bus and two 5-passenger cars on regular schedule and route.

The mayor of Portland, Ore., thru his chauffeur and 7-passenger car tested a populous route, collecting $7.75, with an expense of $4.50, not including chauffeur's wages for twelve hours.

Oak Park, Ill., started a municipal jitney bus the last week in February, running on a route over two miles long. It seats twenty passengers and costs $9.50 a day to operate, including the cost of the lease of the vehicle, so that 190 fares a day will be necessary to pay expenses.

Terre Haute, Ind., started the jitneys early in February and on the 21st had forty-two in operation on all car lines running on paved streets. Operators report satisfactory results.

Milwaukee ($10 license); Denver, Spokane, Wash., with 25; Olympia, Vancouver; Portland, Ore., with 75; Des Moines, San Antonio, Oklahoma City, Joplin and Baltimore are other cities reported to have the service. The first one in Indianapolis started early in February. Cincinnati is reported to have organized a company with $250,000 capital.



¶ GENERAL OBSERVATIONS *and conclusions are perhaps premature, but a few words may not be out of place.*

Receipts are reported to run as high as $15 a day, but the averages reported run $10 or less.

Short routes are the rule, tho the photograph of a Los Angeles jitney shows a sign indicating that its route is far from short.

In New York a year's experience with a law making auto-bus lines common carriers has convinced the Public Utilities Commission that the law subjecting them to commission regulation should be repealed. They say that "there seems to be no sound reason why any person or cor-

poration should not use the highways under proper regulations drawn by the highways department," and that the applications for permits take their time from more important matters. The Oregon legislature has refused to put the jitney busses under the control of the State Railroad Commission, the committee stating that the cities had full power to regulate their operation.

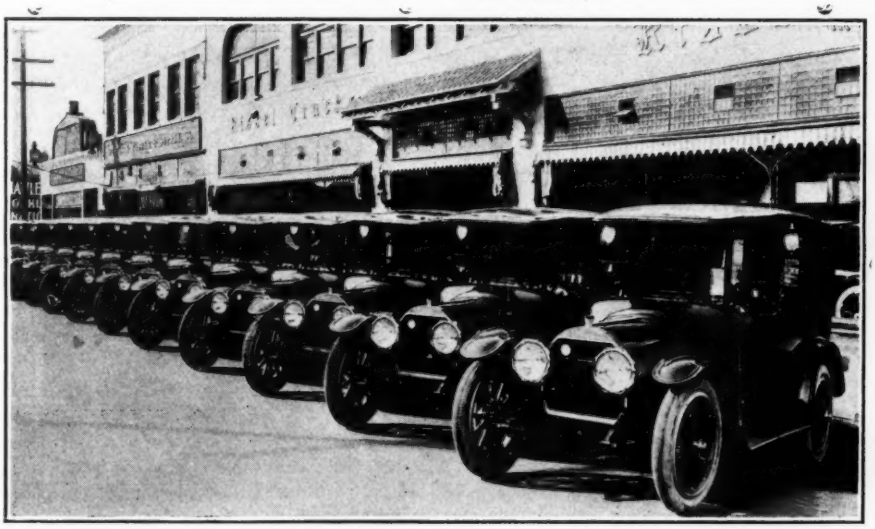
The Fifth avenue (New York) auto-bus lines are successful with 10-cent fare, largely because of the special features of the routes which attract custom and the special character of the regular traffic.

The lines in Indianapolis, intended to serve districts not well served by the street railway, failed to attract custom with a 10-cent fare, or enough to pay with a 5-cent fare, and when the fare was reduced to 25 tickets for $1, to compete with the street railway on equal terms, the receipts were reported to be sufficient for paying operating expenses, but not enough to make adequate provision for replacing worn-out vehicles.

Interurban bus lines in competition with electric railway lines are reported to be unsuccessful at Los Angeles and elsewhere. Suburban bus lines run by the Cleveland street railway where rail lines had not yet been extended were started last August, but have cost much more to operate than the receipts from them.

It seems probable, therefore, that the jitney busses will later drop out except on routes not otherwise more cheaply served. There would seem to be a field for them on such lines and in towns too small to attract a street railway. But, so long as there are cheap, second-hand cars to use up, for which there is no other use, and there is lack of employment for their owners, we are likely to have the jitney bus, regularly or sporadically, as conditions are favorable or unfavorable.

THIS PHOTOGRAPH *of a part of the fleet of Kissel limousine taxicabs purchased by the Los Angeles Transfer Company indicates that there are other systems of transportation still in operation in that city.*



# A PROPOSED STREET LIGHTING CONTRACT

By Charles A. Tripp, Consulting Engineer, Indianapolis, Ind.

*The improvements in street lighting are so numerous and so great at this time that the ordinary street lighting contract, unless made for too short a time for true economy, is not able to keep pace with them. The author of this article, an expert electrical engineer who has had much experience in making and in criticizing contracts between cities and public service corporations, offers a form of contract which seems to have the necessary flexibility and to secure to the city all the benefits of the advances in electric lighting that it wants and at the same time that it provides for proper compensation to the electric light company, neither too great nor too small.*

THERE has been no time since the introduction of electric lighting when the future development of lamps has been as uncertain as it is today. The past six years has seen the advent of the metallized carbon, the tantalum, the tungsten, the nitrogen and the argon lamps in the incandescent field, the latter being placed on the market during the past month, resulting in a present current consumption of about one-eighth of that required by the carbon filament lamp of six years ago. Practically the same period has seen the introduction of the metallic flame arc lamp, followed by a rapid series of improvements and modifications, which have resulted in large gains in efficiency. The future development, even two or three years hence, is certainly beyond the realm of prediction at this time.

Considering this condition, it seems to us that the time has arrived when street lighting contracts between municipalities and public service companies should take a much more flexible form, one which will give the city an opportunity to take advantage of a new type of lamp whenever it desires and yet will protect the company against loss of investment through obsolescence, to an extent that the city can obtain a reasonable rate for the service.

The following contract is based on three divisions of the payment:

First—Current used.

Second—Depreciation and interest on investment.

Third—Maintenance.

Section 1—The said company hereby agrees to deliver to the street lights suitable and necessary current for the lamps installed and the said city hereby agrees to pay the company as full compensation for said current the price of ..... cents per kilowatt hour.

The said company shall furnish and maintain on its switchboard at its plant in said city the necessary watt-hour meters for measuring this current. These meters shall be connected to the lines on the secondary side of all transformers or current regulating devices. They shall be subject to inspection or test by representatives of the city at all reasonable times.

Under this section the company receives pay for the current actually used by the city, as it would in the case of any private consumer for light or power, at an agreed price per kilowatt hour. The current used by any new type of lamp,

or by lamps of different sizes, becomes a matter of no further concern to either party so far as their contract relations are concerned. The city pays for what it gets and the company receives pay for what it furnishes.

Section 2. The said company shall furnish and install street lights of such type or types and at such times and locations as the city may order. Upon the installation of such lamps the company shall render to the city a statement showing the cost of said lamp equipment. This cost shall include the lamp complete with the necessary fittings, hanger and lamp support, whether suspension cable, mast arm, or bracket, and the labor of installing the same, but shall not include the cost of any poles, current-carrying wires or generating equipment. The cost above referred to shall be the company's purchase price of material, plus all carriage charges and the actual amount paid for labor.

It is hereby mutually agreed that the said city shall pay the said company annually ..... per cent. of such statement, in twelve (12) equal monthly payments, for a period of ten (10) years. Such payments shall constitute a full reimbursement for all amortization, depreciation, obsolescence, interest and investment charges, and, after the expiration of the ten (10) year period, no further expense shall incur to the city for the use of said equipment.

If at any time the city desires to substitute a different type of lamp for any lamp or lamps then in use, or discontinue the use of any lamp, all of the remaining yearly installments upon such lamp equipment as is discontinued shall become due and be paid. Upon the installation of such new equipment a statement of cost shall be rendered to the city and payments on the same shall be made as above provided.

Unless a new contract is entered into between said city and said company at the time of the expiration of this contract, all of the remaining yearly installments upon the street lighting equipment shall become due and be paid, and the said equipment shall become the property of the city and may be removed by the city from the poles of the company.

This section gives the city an absolutely free hand in determining when any change shall be made in lamps, and yet protects the company fully in its investment. Whenever a lamp is developed which will produce a sufficient saving to the city in current to make it economical to abandon the old type, the city is free to make the change, without any argument as to price or modification of the existing contract.

Section 3. The said company shall take charge of the operation, maintenance and repair of all public street lights and shall render to the city a monthly bill covering the cost of all incandescent lamps used for renewals, electrodes for arc lamps, repair parts and glassware used during the previous month, plus ..... per cent. Such ..... per cent. shall be considered as reimbursement to the company for stock charges and for labor for maintenance and care of the lamps.

This section likewise is in such form that no additional agreement will be required for any change in the type, number or size of lamps. The company is responsible for the proper operation of the equipment, and receives pay for what it does. While the objection can be raised to this section that it produces a bill which it is difficult for the city to check, yet this carries small weight on account of the fact that the total item is a small one, and that most new types of lamp can be bought under a maintenance cost guarantee from the manufacturers.

# NIDD VALLEY RESERVOIR

## OF BRADFORD, ENGLAND, WATER WORKS.

THE city of Bradford, in Yorkshire, England, is the center of the woolen and worsted industry in England, and the imported wool from Australia, New Zealand and other places comes into the city in its raw state and requires washing and combing, hence the city requires a good supply of water to carry on successfully the chief industry.

Besides supplying the needs for industry, the city provides water not only for itself but for twenty-five other towns outside. This demand is equal to 15,000,000 to 18,000,000 per day, in an area of over 120 square miles and a population of about half a million people.

To meet these demands the City Council had to seek powers to embark on the Nidd Valley water works scheme, which was designed by the city's water works engineer, James Watson, M. Inst. C. E. This scheme includes the Angram dam, which is situated some 32 miles away from the city. This dam is in course of construction, was commenced in 1904 and will require two or three years more to complete. The amount for this vast undertaking was about $1,400,000 (£365,495) and the amount of concreting and masonry runs to 258,700 cubic yards.

The dam forms the first of the large storage reservoirs to be constructed in the Nidd Valley for the city's supply. The outflow of water is controlled by a valve tower built on the inner face of the dam. This valve tower, which has three inlets from the reservoir, is built of masonry and lined thruout with cast iron cylinders enclosing the valves, upstand pipes, deck plates, head stocks, etc., and the valves will be worked and operated by hydraulic pressure.

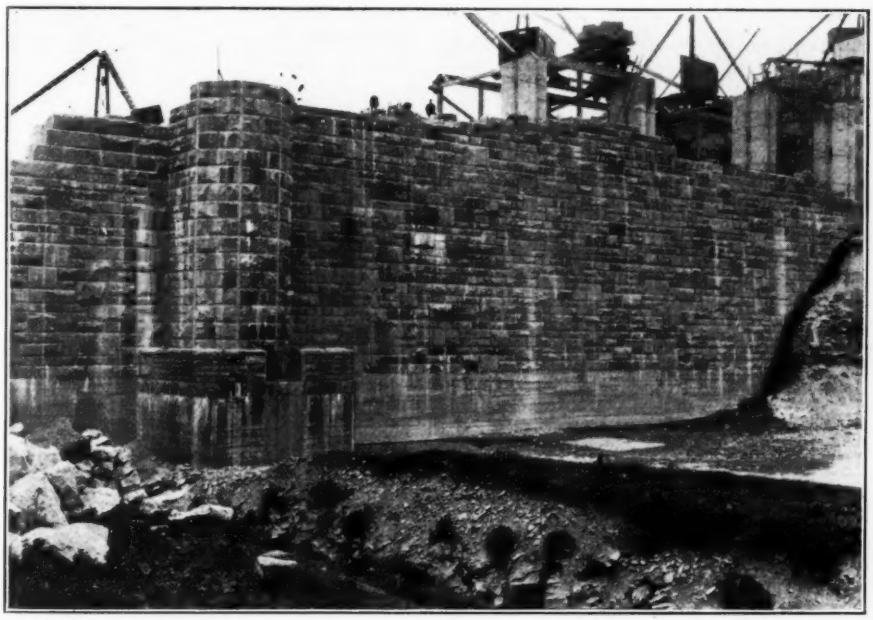
By-pass or waste-water channels have been constructed on each side of the dam for convenience in carrying out the work, keeping water from the foundations, etc., and for the purpose of carying flood water past the dam.

The concrete mixers on the works can turn out some 320 cubic yards of concrete per day and there are often 500 to 700 men employed on the works. For works of this magnitude the municipal authority has provided on the site a

METHOD OF CONSTRUCTION *of dam. Above, concrete piers, gravity cranes and tracks, and beginning of masonry face. Below, up-stream masonry face of dam, and inlet tower.*

school for the workers' children, a reading room for the workmen, and an infirmary with resident doctor and nurse.

The corporation, in order to cope with the immense quantities of material that would be required in the process of construction, built a railway some 13 miles in length, which is the only passenger railway in Great Britain coming under the power of a city or town council.



# PUBLIC RECOGNITION OF PATENTS

By George C. Warren, Boston, Mass.

*This article is the introduction to a lecture delivered by the author in the course of the Graduate School in Highway Engineering of Columbia University, and it states the principles upon which the issuing of patents is based so clearly and so fully that it is worthy of a prominent place in engineering literature on its own merits. The patent as a contract and as a monoply are discussed and legal decisions are quoted. State regulation of the use of patented articles is also fully considered.*

AMONG the earliest and most world-wide and universally recognized economic governmental principles among civilized nations is one that it is to the interest of the public that, as an encouragement to "promote progress of useful arts," the inventor should, for a limited period, be given the exclusive right to use, manufacture and sell his invention and hold to himself and those who financially and otherwise assist him in its perfection and development, all profits which accrue therefrom—a legal monopoly or "patent." The principle is not only a world-wide national economic institution, but, in order that governments may secure the full benefits of the results of invention in other countries, it has become international and we have a treaty under the name "international convention," the chief feature of which is that application may be filed in any one or all of the other countries which are a party to the convention within twelve months after the filing of the first application in any convention country.

The countries which have joined in this international agreement or treaty with respect to issuance of patents are the United States, Austria, Hungary, Bosnia and Herzogovina, Belgium, Brazil, Cuba, Denmark and Faeroe Islands, Dominican Republic, France, Algeria and all French Colonies, Germany, Great Britain, Japan, Mexico, Norway, Dutch Indies, Surinam, Curacao, Portugal with the Azores and Madeira, Servia, Spain, Sweden, Switzerland, Tunis, Commonwealth of Australia, Italy, Netherlands and Guatemala.

In his "First Annual Address" to the "Fellow Citizens of the Senate and House of Representatives," dated January 8, 1790, President George Washington said:

"I cannot forbear intimating to you the expediency of giving effectual encouragement as well to the introduction of new and useful inventions from abroad as to the exertions of skill and genius in producing them at home."

From reply to this message by the Senate, dated January 11, 1790, the following is quoted:

"The introduction of new and useful inventions from abroad and the exertions of skill and genius in producing them at home * * * are objects which shall receive such early attention as their importance requires."

Sixty-four years later, President Franklin Pierce, realizing that the patent franchise, as it had at that time developed, was too narrow and did not offer sufficient encouragement to invention, in his message to Congress dated December 5, 1853, used these words:

"I commend to your favorable consideration the men of genius of our country, who, by their inventions and discoveries

in science and arts, have contributed largely to the improvement of the age without, in many instances, securing anything like an adequate reward. For many interesting details upon this subject I refer you to the appropriate reports and especially urge upon your early attention the apparently slight, but really important, modification of existing laws therein suggested."

It is certain that any individual, municipality or other community that refuses to use or purchase a patented article is seventeen years behind the times, for practically every invention of merit is patented and the patent does not expire for that period.

It is equally certain that any individual or community which undertakes to undermine a patent, after the patentee and his associates, by expenditure of large measures of brain, money and energy, have developed a market for his useful invention, is practicing a most unfair attitude not only toward the inventor, but toward the government which has adopted the patent system as an economic institution for the purpose of fostering and encouraging invention, which is essential to progress.

A community which does not invent is one which is centuries behind the times, and a country which does not foster inventions by patent franchise is a country in which there is little progress in industry, art or science from century to century.

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¶ THE PATENT FRANCHISE *is a contract of the government with the inventor for the benefit of the people as well as of the patentee.*

The patent franchise is not by any means a present from the government to the inventor, but is a carefully planned contract which in the United States has its foundation in the Federal constitution on which our government is based, an agreement between the government and the inventor with consideration on each side under which:

1. The inventor undertakes to:

(a) Perfect to a practical result an idea which it would not be worth expenditure of his time, energy and money to develop if the public was to have all the resulting benefits.

(b) To fully and publicly describe his invention so that, at the expiration of the patent, he will have dedicated to the public such full information regarding the invention, without trade secret reservations, as will enable one skilled in the art to prosecute the invention.

2. In consideration of the foregoing the government grants to the inventor the exclusive right to prosecute his invention for a limited term of years, which varies in different countries. In the United States the term was formerly fourteen years with a privilege of renewal for seven years more, making a total patent franchise term of twenty-one years. This was changed in 1861 to a flat term of seventeen years from the date of issue of the patent, with no right of renewal.

Here we have an evenly balanced, well considered contract, with clear-cut, definite and valuable consideration from each party to the other—the government representing the interests of the public on the one hand and the inventor on the other.

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¶ A PATENT *is not a true monopoly, tho it gives to its owner a certain control of the sale and use of the invention for a limited time.*

A patent is not a monopoly in that objectionable sense in which the term is generally used. Decisions of the highest court of our country tell us that it is such a monopoly as was expressly authorized by the constitution of the United States, and that Congress has enacted laws to promote improvements in the arts and sciences by securing to inventors for a limited term a monopoly of the right to make, use and vend their inventions. It has been universally conceded that these laws are highly beneficial. Years before the adoption of the constitution, the English Parliament, in the reign of King James, enacted a statute (21 Jac., Ch. 3) giving inventors exclusive rights for fourteen years.

The following citations from decisions of the Supreme Court of the United States

and quotations from standard text-books should uproot any impression that there is anything injurious to the public in the limited monopoly granted to inventors.

*Extracts from United States Supreme Court Decisions.*

"It is undeniably true, that the limited and temporary monopoly granted to inventors was never designed for their exclusive profit or advantage; the benefit of the public or community at large was another and doubtless the primary object in granting and securing that monopoly. This was at once the equivalent given by the public for benefits bestowed by the genius and meditations and skill of individuals, and the incentive to further efforts for the same important objects." *Kendall v. Winsor*, 21 How., 327.

"Letters Patent are not to be regarded as monopolies, created by the executive authority at the expense and to the prejudice of all the community except the persons therein named as patentees, but as public franchises granted to the inventors of new and useful improvements for the purpose of securing to them, as such inventors, for the limited term therein mentioned, the exclusive right and liberty to make and use and vend to others to be used their own inventions, as tending to promote the progress of science and the useful arts, and as matter of compensation to the inventors for their labor, toil and expense in making the inventions, and reducing the same to practice for the public benefit as contemplated by the constitution and sanctioned by the laws of Congress." *Seymour v. Osborne*, 11 Wall, 533.

In *Allen v. Hunter*, 6 McLean, 306, the Court, denying that patents are monopolies, said:

"The right of the patentee entirely rests on his invention or discovery of that which is useful and which was not known before. And the law gives him the exclusive use of the thing invented or discovered for a few years as a compensation for his 'ingenuity, labor and expense in producing it.' This, then, in no sense partakes of the character of a monopoly."

In *ex parte Robinson*, 4 Fisher, 186, Judge Davis said:

"The property in inventions exists by virtue of the laws of Congress, and no state has a right to interfere with its enjoyment, or to annex conditions to the grant. If the patentee complies with the law of Congress on the subject, he has the right to go into open market anywhere within the United States and sell his property."

¶ STATES CAN REGULATE *use of patented articles, but cannot prohibit such use simply because they are patented.*

It is true the several states, in the exercise of their police power for the protection of the public health, safety and morals, have the right to regulate, within reasonable limits, the use of a patented article within their borders, if either of the above interests should be affected by its use, but no state has the right, directly or indirectly, to prohibit the use of any patented article simply because it is patented, unless its use can be construed to injure the public health, safety or morals.

Judge Brawley, a distinguished judge of the United States Circuit Court of Appeals, has said of patents:

"The protection and hope of profit, held out by our patent laws, inspires that stimulating energy which leads to experiment, invention and all the resulting benefits." *Crown Cork Co. v. Aluminum Co.*, 108 Fed. R., 870 (1901).

These opinions of the highest courts of the country suffice to show the favor with which the law regards patent rights. Is it believed to be right that an inventor should be persuaded to forego the rewards which a just and beneficent law of Congress has bestowed upon him in recompense for his years of toil?

In the case of *Kendall v. Winsor*, cited above, the Supreme Court said:

"But whilst inventors are bound to diligence and fairness in their dealings with the public, with reference to their discoveries, on the other hand they are by obligations equally strong entitled to protection against frauds or wrongs practiced to pirate from them the results of thought and labor, in which nearly a lifetime may have been exhausted; the fruits

of more than viginti annorum lucubrationes, which fruits are ultimately to gather."

It is no just criticism of either the principle of or results from the patent franchise to say that a very large percentage—certainly much more than half—of the patented inventions have so little practicable merit that little is heard from them after the patent is issued and that a smaller percentage fail after practical trial and the expenditure of a large amount of brain, energy and capital in development of the invention.

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¶ THE TELEPHONE, *the electric light, the wireless telegraph, have required years of time and millions of money to develop them, which could not have been expended if those making the improvements, as well as the original inventions, had not been protected during the lean years before they could be shown to be practical essentials in everyday life.*

Does any one suppose that either Prof. Bell, in the case of the telephone, or Dr. Edison, in the case of the electric light, and the hundreds of others operating with them in reducing their ideas to practical results, would or could have expended the years of patient effort and millions of money necessary to accomplish their magnificent results, if they had not seen ahead a compensating encouragement and reimbursement for their investments in time or money, which compensation was only possible through the granting and operation of the patent franchise?

It is well known that even with the encouragement offered by the patents, both the Edison and Bell companies passed through years of anxiety and nearly through bankruptcy before their inventions were a practical success, and the same may be said of nearly every invention which is sufficiently novel and sufficiently universal in its application to become a real factor in the world's progress. Calmly ask yourselves the questions: "Is the world indebted to Bell and Edison, or are they indebted to the world? What does it matter if they and their associates ultimately made millions before their patents had expired when, on the other side of the balance sheet, we see that we can converse between New York and Chicago as clearly as we can converse in this room, and that the clearest and most economical light is produced by chaining natural water power, converting it into electric current and transmitting the current often hundreds of miles, into our homes, offices and streets?" On the evening of January 25th it was demonstrated that conversation can be clearly carried on by telephone from Boston to San Francisco, over more than 3,200 miles of wire, and not only the words clearly understood but the voice recognized.

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¶ THE DEVELOPMENT *of the great inventions to their present practical values has been possible because of the patent system and its protection of the enormous investments necessary to make these developments and put them into use.*

On a recent visit to Arizona I was impressed with the magnitude of the hydro-electric power, heat and light development for which Dr. Edison is chiefly responsible. A few years ago that state was an arid desert. No vegetation—wood, coal nor oil. From the Roosevelt dam, developed by the government, in the northern part of the state, abundant water for irrigation is carried hundreds of miles, converting the desert into one of the most productive and diversified agricultural communities which any country of the world has ever produced. Coincident with this, from the same dam, power and electricity are developed which, thanks to the patented inventions of Edison and others, is carried hundreds of miles and supplies the universal heat and light required by the community at a fraction of the cost of any other heat and light because of the absolute absence, in that state, of the elements necessary to provide other forms of heat and light—coal, oil and wood.

I care not how many millions Edison and his associates may have made out of their patent franchises, the public in the single state of Arizona is making many times that amount by reason of those franchises. Another incident in Phoenix, Ariz.,: I wrote a telegram and was asked

by the hotel clerk if I wanted it sent by wire or wireless telegraph. Actually, Marconi is competing with the Western Union and Postal Telegraph companies in that state which, ten years ago, was a desert. Will any one claim that that development would have been a possibility if Marconi had not been granted patents covering his inventions? And so down the scale you may trace any and every successful patented invention add you will find the patentee has given more than he has received and, almost as universally, the invention would never have been perfected and developed if the encouragement of the patent franchise had not been granted by the government.

I have specially dwelt on the foregoing phase of the patent franchise because a considerable, and, I fear, a growing part of the community looks upon the patent as a sort of monopolistic graft which should not have been granted and which any one has a moral right to appropriate.

With equal certainty of not being caught, people who would not steal a horse will, without compunction, steal a patent although the investment of the owner is much greater in the patent than in the horse. Morally, one of the forms of theft is the same as the other. Legally, in the case of the horse, the thief goes to jail if caught, but, in the case of the patent, the law in effect says to the owner:

"You may litigate and in the end you will get recovery in damages, provided your pocketbook is long enough to stand the onslaught which your pilfering competitor wages on you."

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¶ THE COMMON CLAIM *that a simple and common idea has been patented when it deserved no such protection is disposed of by the courts, as in an English case here quoted.*

In an unusually important and interesting English patent infringement case, the *Edison Bell Phonograph Corporation Limited vs. Smith & Young* (Reports of Patent Cases, London, Volume 11, page 398), the Court of Appeals of Great Britain in discussing the impropriety of certain highly technical, tho common efforts of endeavoring to defeat patented inventions, which by practical development have proved to be of merit and general public utility, used the following forceful language:

"Whenever I hear the objection taken to a patent which has been used, which has been bought and sold, which has been therefore treated by men of business as a useful thing, that it is wanting in subject-matter, I look upon it, I confess, with an amused contempt.

"What is the meaning of want of subject-matter. It is not the same thing as want of invention, or rather I should say as want of novelty; it is not the same thing as want of utility, but, where you cannot maintain either of those propositions which would be sufficient to destroy the patent, it is something else, which some one or other, at some time, has invented as an idea for destroying patents. And what is it? It really comes to this, that, although the invention is new—that is, that nobody has thought of it before—and altho it is useful, yet, when you consider it, you come to the conclusion that it is so easy, so palpable, that everybody who thought for a moment would come to the same conclusion; or, in more homely language, hardly judicial, but rather businesslike, it comes to this, it is so easy that any fool could do it. Well, I look, as I say, upon that objection, when all others have failed, generally with amused contempt. It can be made, out, but hardly ever. When you find that which I have stated, it is hard to think that people would be buying and selling a thing—and that has been sometimes the whole thing—and yet the objection should be taken that it is wanting in subject-matter."

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¶ SUCCESS *where others have failed is often given in court decisions as evidence of patentability.*

Touching on the trend of the court cases where the patentee has produced a successful result where others, working along somewhat similar lines, had failed to accomplish that result, where, in other words, there is sufficiently close relation between the "prior publication" or other "disclosure" and the successful patented

result but producing the all-important difference between "failure and success" respectively, but sufficiently close relation to provide means for ingenious attorneys to wage a contest against the patent, the following extracts from important decisions are interesting:

"Inventors are not precluded by the embryonic and shapeless ideas found in former patents, any more than they are by such undeveloped matter existing elsewhere." (124 F., 486, *Canda vs. Michigan*).

"Courts incline to sustain a patent to the man who takes the final step in the invention which turns failure into success" (*The Barbed Wire Patent*, 143 U. S., 275).

"The great commercial success of a patented device may turn the scale on the question of invention in a doubtful case" (*Beckwith vs. Malleable Iron Range Co.*, 174 F., 1001).

"The widespread commercial success of a patented device should be taken into consideration in determining the question of invention" (*Coffield Motor Washer Co. vs. Howe et al.*, 190 F., 42).

"The fact that as soon as a patented improvement was made and introduced, its advantages over devices which had preceded it became manifest at once, and it commended itself to the public as a practical and desirable improvement, affords a safer criterion of inventive novelty than any subsequent opinion of an expert or intuition of a judge" (*Palmer vs. Johnston*, 34 F., 326).

In *Expanded Metal Co. et al. vs. Bradford et al., etc.*, U. S. Sup. Ct. 143 O. G., 863, Mr. Justice Day says:

"It is often difficult to determine whether a given improvement is a mere mechanical advance or the result of the exercise of the creative faculty amounting to a meritorious invention. The fact that the invention seems simple after it is made does not determine the question; if this were the rule, many of the most beneficial patents would be stricken down. It may be safely said that if those skilled in the mechanical arts are working in a given field and have failed after repeated efforts to discover a certain new and useful improvement, he who first makes the discovery has done more than make the obvious improvement which would suggest itself to a mechanic skilled in the art, and is entitled to a protection as an inventor. There is nothing in the prior art that suggests the combined operation of the Golding patent in suit. It is perfectly well settled that a new combination of elements, old in themselves, but which produce a new and useful result, entitles the inventor to the protection of a patent" (*Loom Company vs. Higgins*, 105 U. S., 580-591).

"If our purpose was speculative, not practical, we might pause to wonder how such substances could produce such results under the conditions to which they are subjected, and by wondering we express in a way the quality of the invention. * * * We need not, however, dwell longer on the excellence of the invention. The government has testified to its excellence by using it in the guns intended for the national defense" (*United States vs Societe Anonyme des Amiens Etablissements Cail*, 178 O. G., 591).

# TRAFFIC CONTROL

## AT ELECTRIC RAILWAY CROSSINGS.

*The electric railway can use the current from its own wires to operate audible and visible signals so that its problem of protection of crossings of its line with highways, steam railroads and tracks of its own or other electric railways is comparatively simple. In this article are described a signal system for a street railroad crossing on a busy city corner and automatic signal systems for highway crossings of interurban roads which have the advantage over ordinary railroad crossing signals of being visible as well as audible by night or day, and of showing to the motorman whether it is in operation.*

RAILWAYS operated by electricity can use the electric current in operating signals at crossings with other railroads or at highway crossings so that they will not be subject to the breaks in service liable in battery systems. They can be either audible or visible or both and can be made automatic if desired.

The first of the accompanying illustrations shows a novel and practical street-traffic control system as installed at the intersection of Euclid avenue and East 105th street, on the Cleveland 3-cent-fare street railway system.

Electric lights are placed on the right-hand side of each street so as to face oncoming vehicles. A red light denotes stop and a green light proceed. The red light is placed on the near corner of the crossing and the green on the farther corner. The officer who controls the switch is stationed in a booth to the left in the accompanying illustration. The sides of the booth are glass and this enables the officer to see traffic in all directions. The switch is so interlocked that it is impossible to give conflicting signals.

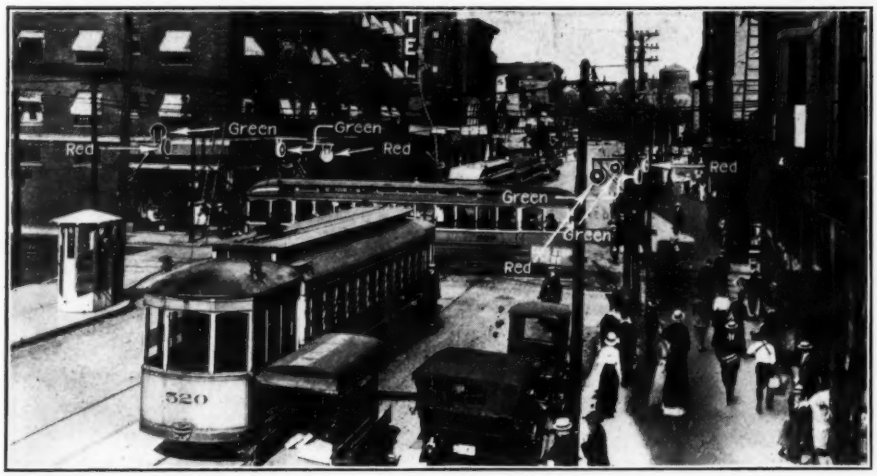
When traffic is opened in one direction it is automatically closed in the other direction. When an alarm is turned in at fire headquarters an instrument in the booth notifies the officer so that he may clear the crossing for the passage of the fire apparatus. After throwing an emergency switch which sounds an alarm bell and flashes red lights at all crossings, he is free to leave the booth and give his attention to the street.

The photograph is self-explanatory, tho a little study may be necessary to distinguish between the lights showing up and down Euclid avenue and those showing to 105th street.

A highway crossing protection has been installed on the Washington-Virginia Railway Company lines, with trolley-contact control adapted to the operating conditions. One of these has been in successful operation for a long period on a single track and two others on double tracks have recently been installed.

At Clark station, on the Falls Church division, which is double track, the headway is 30 minutes during the day and 15 minutes in the evenings. Trains are run in sections, as many as four or five following each other closely. The highway crosses at right angles and at a considerable grade, but the view of the railway from the highway is obscured by trees, brush and a high bank on three of the corners.

The apparatus installed at this crossing consists of an iron pole having the sign, bell and relay attached to it, and the control box a part of it. The starting contacts, operated by the trolley wheels, are




SEMAPHORE STREET CAR SIGNALS *at crossing in Cleveland, O. Starter's box at left. Note carefully red signals on near sides of crossings for stop signs, green signals on far sides for safety signs. Both cannot show at once. Lights by night and discs by day.*

placed about eight poles from the highway in each direction on the corresponding track, and the stopping contact is at the highway, there being four contacts in all. Flashing pilot lights are located three poles ahead of each contact to indicate the bell operation to the motorman. The control circuit, bell and lights are all tapped from the trolley, and no other source of power is used. The speed reaches a maximum of about thirty miles per hour under the contacts, the bell ringing twenty to twenty-five seconds before the car reaches the crossing. The warning indication is given by a 12-inch bell and a transparency flashing the word "Danger," one of the series of lights in this transparency being run each way to the indicator.

As the car passes the starting contact and is approaching the crossing, the action of the bell is shown to the motorman by the flashing light in the indicator. The use of a flashing light as a return indication of the actual ringing of the bell has been favorably received by the railways, as it overcomes an objection to crossing signals that the motorman must proceed assuming the bell is ringing.

There are six 23-watt 110-volt mazda lamps, shunted by resistances, so that the failure of one lamp does not affect the operation of the remainder. The flashing of the lights is produced by a contact maker on the armature of the bell clapper. On account of cars following closely over the crossing, a type of bell was chosen having a car-counting control such that the bell will not be cut out at the stopping contact until all the cars that have passed the starting contact have also passed the stopping contact.

The sign consists of a neat cast iron danger transparency with red lights within, accessible by opening latched doors at the side, the letters in the transparency being six inches high. The words "Railroad Crossing" in raised letters are arranged in a circle around it. The bell and relay unit hang on the pole below, the hammer striking the bell thru an opening from within, making a weatherproof construction. The relay unit comprises a pair of counting magnets, operating a revolving switch in the manner of a drum controller, and the bell magnet, which breaks its own circuit. The contacts are oil break, the oil tank covering the entire relay.

Below the bell, about the height of a man, is the fuse and control box, from which all bell circuits may be tested out, disconnected or fused, and the bell started and stopped manually. The wires enter the standard in a cable suspended from a messenger wire as is usual on

CROSSING SIGNAL *at Hume, Va., operated by cars on either track. The word "Danger" is lighted and the bell is rung by car approaching on its proper track.*

switch indicators. The entire standard is mounted on a concrete pedestal by foundation bolts.

There is a similar signal at the double-track crossing at Hume, on the Alexandria division. There is a good view of the tracks both ways from the highway, which crosses at 45 degrees. This is an important and busy thorofare. Cars pass every 20 minutes during the day and every 10 minutes during rush hours morning and evening. Cars are run singly and with trailers having no trolley.

At Military road, near Rosslyn, Va., on the Falls Church division, there is a single-track crossing signal installed on a main highway leading to Fort Myers, where maneuvers are held, and funerals and tourists' sight-seeing cars pass frequently. Trolley cars follow each other closely at certain times of the day, passing every quarter hour. The starting contacts in this installation are about nine spans away from the highway, three contacts being used. The control of this type of bell is both car-counting and directional.

The frequency of cars at this point amounts to the bell ringing about one hour in the twenty-four hours. The bell and relay unit with bracket is mounted on an existing pole and a separate danger transparency is hung by a bracket on the same pole. This is somewhat novel and consists of a sheet-iron sign with letters twelve inches high, composed of small lens-like glasses, with many facets, the letters themselves being white on a black background. The subdivision of the glass into a multiplicity of small units is a protection against malicious breakage, and, like the military mast on warships, would require many blows to demolish it.

The photograph above shows the crossing at Hume with the door of the control box open, while in that below the environments of the crossing may be seen. To the right and above the signal the trolley contact may be seen. This has no moving parts.

VIEW OF ROAD *at the Hume crossing shown above. The signal is visible for a considerable distance in either direction, and the road makes a sharp angle with the tracks.*

# SEWAGE DISPOSAL WITHOUT ODOR

**By Rudolph Hering, Consulting Engineer, New York City.**

*This article is that part of a paper before the American Association for the Advancement of Science at its Philadelphia meeting, which is devoted particularly to the methods for treating the collected sewage and rendering it innocuous, and considers them specially with reference to making the processes inodorous, at least to the extent that they shall not become offensive to surrounding inhabitants of the district. The author is fitted to speak with authority, having done as much as any one to introduce inodorous methods of sewage disposal.*

ALL processes of sewage treatment and disposal, if they are to be satisfactory, permanent and economical, should require a separation from each other of the floating matter, of the settling matter and of the liquids.

As these three parts of the sewage are materially different substances, one being solid and light, one solid and heavy and one liquid, the methods of economical treatment in order to make them inoffensive will also be different in nearly every case, and therefore a separation is generally to be recommended. It is not always made, and at some places it may not yet be of sufficient importance to justify the additional expenditure. The drift of opinion, however, is clearly in the direction of separation and we should endeavor to design our works accordingly.

The floating matter can be retained with little trouble and expense, either by screens or as scum in settling tanks. Being often offensive, the best disposition is usually by fire or by burial. Numerous screen designs are now in use, but there is practically no preference so far as the prevention of odors is concerned.

The settling matter which forms the so-called sludge is that part of the sewage which has always given the greatest amount of trouble, has constituted the greatest nuisance, and until very recently has successfully defied a treatment which would make disposal inoffensive.

The bulk of the sludge does not decompose by oxidation. Its exposure to the air allows but a thin film to oxidize at the surface, but the exposure permits it to take up many species of bacteria, some of which cause offensive putrefaction. Many ways and means have been tried for the last fifty years, both in England and Germany, to get inoffensive sludge decomposition. A solution has at last been found in an expedient which allows the sludge to decompose under water, with the practical exclusion of fresh sewage and air.

The first step towards getting this result was taken by Dr. W. O. Travis, of Hampton, England, who devised a two-story tank, the upper division serving as a settling tank, with a slot at the lower edge of an inclined bottom, thru which the settling suspended matter passed into the lower division to accumulate and decompose. The in and outflows of the two tanks were so proportioned that from three-fifths to four-fifths of the sewage passed thru the upper division and one-fifth to two-fifths thru the lower one. So far as an inoffensive sludge decomposition is concerned, this Hampton tank is not a success.

The same two-story tank was later built in the Emscher district of Germany by

Dr. Ing. K. Imhoff, with at least one important change. No sewage whatever was allowed to pass thru the lower tank, causing a practical exclusion of any part of the sludge from a continuous contact with fresh sewage and air. Other advantageous changes were suggested.

The decomposition of the sludge takes place in the lower division of the tank in the absence of dissolved oxygen in the sludge, but the novel condition is that it continues in the absence also of sulphur bacteria producing sulphureted hydrogen, and in the presence of bacteria producing substantially only methane and carbon dioxide gases, neither of which has an offensive odor. The conditions in the tank gradually become adjusted to conditions favoring the life of substantially only those two classes of bacteria and causing practically all of the others to perish.

¶ AN EXPERT REPORT *shows the inoffensive character of sludge treatment in absence of light, air and fresh sewage.*

The Royal Institute for Water Hygiene in Berlin, through Prof. Dr. K. Thumm and Prof. Dr. C. Reichle, has recently issued a report on the results of a thoro investigation of this new method of inoffensive sludge treatment, from which substantially the following conclusions are extracted:

The process of decomposition of sludge is found to differ sometimes quite materially according to the character of the sewage. The same arrangements and designs will, therefore, not suit all of the conditions nor all localities. The topographical conditions, especially as to available areas and elevations, make different designs a necessity for economical reasons. They will determine whether the sludge decomposing chamber should be located below (Emscher tank) or beside the settling tank. In all cases a sharp distinction must be made between a simple settling of the suspended matter and the decomposition of the sludge.

During the process of ripening the sludge of the Emscher tank has a grayish color. When ripe it is deep black, has a peculiar tar-like though not disagreeable odor, and easily allows its water to drain away in a fairly clear, colorless condition and without a putrid odor. The sludge reacts alkaline. When left too long in the sludge chamber and when it has become over-ripe, it again changes to a grayish color and has an offensive odor, it does not easily drain its water and has a distinct acid reaction. In order to decompose quickly and satisfactorily sludge should not be acid. If found to be so, it is generally due to an excessive vegetable diet. It should then be brought into intimate contact with a sufficient amount of slightly acid-neutralizing bodies, among which the most common are fresh sewage and hard water.

¶ ALKALINE SLUDGE *is essential and can be secured and maintained by several methods here clearly stated.*

The Berlin Experiment Station has pointed out the great desirability of having a proper mixture of sludge and sewage in order to secure a good alkaline sludge. It is, therefore, advised for this purpose to install a mechanical agitator in the tank, to be used daily for effecting a thoro mixture. The results of this agitation were always found to be good. The introduction at the bottom of compressed air escaping and rising thru the sludge was also found to be effective, tho less so than mechanical agitation.

It was also found essential to withdraw the decomposed sludge regularly, frequently and in small amounts. If not so withdrawn and at the proper time, it is apt to become acid and dead.

It sometimes occurs that on the surface of the tank there is an undue frothing and excessive scum formation. After due consideration and experiment it was found that these objectionable conditions could be removed by draining off the sewage in the sludge chamber and refilling the same with clean water from the municipal supply, especially if it had considerable temporary hardness. In some cases a good sludge can be produced only by the addition of slight quantities of

alkalies, as lime or soda, to the sewage.

The Berlin Experiment Station gave a careful study to the scum and frothing in the settling tank and in the chimneys connected with the sludge chamber, other important conclusions being as follows:

¶ FROTHING *and consequent overflow of the frothing material is troublesome, but can be prevented by the methods described.*

It is not advocated as a permanent measure to reduce the scum cover in thickness by merely an occasional stirring with poles or by breaking it up with a stream of water. It is preferred to use a permanent mechanical apparatus or agitator which not only stirs the scum but brings about a thoro mixture of it with the sewage, subsequently allowing the necessary time for sedimentation. Frothing is found to be due mostly to large amounts of gas rising to the surface from the sludge chamber and carrying up finely divided sludge with the bubbles. Agitation usually prevents this trouble. When the sludge in the lower chamber is ripe, the scum formation in the upper chamber is light.

When there is great activity in the decomposition, sludge particles rise thru the slot into the upper chamber in spite of the usual overlapping of one side of the slot, intended to prevent such rising. Sufficient room should be provided for accommodating the floating sludge in order to prevent operating difficulties.

¶ SLUDGE TANKS *may be placed below or alongside the sewage settling tanks, with the advantages and disadvantages here stated.*

Studies were made of the effects of the relative advantages of two groups of tanks, one having the sludge chamber below and the other beside the settling chamber.

The first group has the great advantage of an automatic sludge separation. It has the disadvantage frequently of increased expense due to the greater depth of excavation. This greater depth has in itself the advantage of placing the gases of decomposition in the lower tank under increased pressure, which causes the sludge to expand, become more porous and more readily drained when it is withdrawn and discharged on the surface of the ground. Another disadvantage of the first group is the necessity of giving a very close attention to the sludge removal, and to get the right proportion of capacity between the upper and lower chambers. Unless the proportion of sludge to the superimposed liquid approximately corresponds to the character of the sewage and sludge, the results may not be satisfactory in finally turning out economically an inoffensive sludge. Expert supervision is required, particularly during the period of ripening.

The second group has the disadvantage of pumping or of conveying the sludge from the settling to the sludge decomposing tank. It has also the disadvantage of producing less easily drainable sludge, due to the shallowness of the tanks. It has the advantage of a complete separation of the two tanks, so that the sludge decomposing tank can never thru irregularities have a detrimental influence on the settling tank. Extensions can also be more easily made to the tanks and they can be more readily inspected.

The separate sludge decomposing tanks can be built as single units which are intermittently filled, or they can be built as a series of tanks continuously operated.



¶ THE OBJECTIONS *to the dilution method of sewage disposal are often due to improper application of the process, which is, after all, the natural process.*

The City of Baltimore has installed separate sludge decomposition tanks and the experience there gained will be valuable. The City of Brookline is conducting some experiments with a similar device of using tanks beside each other and also one over the other. The decomposed sludge is found to be equally good in both cases. The preference between the two methods may usually be decided by the

relative economy and facilities for construction and operation.

Considering now the last part of the sewage to be disposed of, namely, the liquid, we find that the commonest, because cheapest, way of disposal is to turn it into running water. This process is called the dilution method.

There has been much popular objection to such a disposal, partly due to cases that have caused much offense and partly due to sentiment. Neither reason is valid against the method if it is properly applied.

Most of the objectionable organic waste matter on the surface of the earth is by nature discharged into and purified by either air or water. Our exhalations and all gaseous waste products are purified by a preliminary dilution in the air. All the rain water flowing over the surface of the earth, the accumulated wastes of animal and vegetable life, are washed into rivers and then into the ocean. Some rivers purify such waste matters within a few miles of flow. Some cannot purify at all water loaded with suspended mineral matter. As soon, however, as the ocean or a large lake is reached, all objectionable waters are completely purified.

The dilution method is quite efficient for sewage disposal and is in every way satisfactory, provided we recognize the principles on which it can be carried out. There is a certain varying amount of oxygen dissolved in all running fresh and salt water, which is taken up from the overlying atmosphere in accordance with well established physical laws. On the other hand, there is a certain varying amount of oxygen required by the different parts of the organic matter of sewage which is necessary to oxidize it. Therefore, generally speaking, we have the question as to how much of this oxidizable organic matter can be decomposed by the available dissolved oxygen in the water.

A large number of chemical, biological and physical examinations have been made to determine the elements of this problem. A large number also of actual cases of sewage disposal by dilution for American and European cities have given practical demonstrations of the advantages and limits of this method of disposal. The conclusions which may now be drawn from all the evidence are quite satisfactory.



¶ THE REQUIREMENTS *of safe discharge of sewage into running water are simple and are briefly stated.*

In order to discharge sewage safely into running water so as not to create nuisance, we should first deprive it so far as practicable of all floating matter which would deface the surface of the stream, and of all heavier matter which would settle and deposit on the bed of the stream. The remaining liquids should be discharged so far below the surface as practicable and dispersed into and distributed thru a body of flowing water which is great enough to contain the necessary oxygen required to oxidize the organic matter coming in contact with it. A sufficient dilution causes an immediate cessation of all nuisance, if one existed, or prevents its occurrence, if the above simple conditions are maintained. By following such a practice no offense to sight or smell can ever arise.

Another method of oxidizing the liquid sewage is to expose it in such a way that atmospheric oxygen will cause the oxidation of the dissolved organic matter. This is done by the well-known methods of so-called filtration.

The liquids are made to pass through a bed of sand or broken stone, so that the surfaces of the grains become wetted by the percolating sewage. The surfaces in a ripe filter are covered with a gelatinous film, supporting myriads of bacteria which decompose the dissolved organic matter contained in the liquid percolating thru the film. The decomposition takes place in the presence at the film of a sufficient quantity of oxygen containing air and of a suitable temperature for the best bacterial activity. There is a definite relation between these factors, and it will be possible, eventually, to arrange them so that the greatest bacterial activity can be determined at the least cost for each given case. This branch of the

science of sewage purification yet needs some further development to determine in all cases the best proportions.



¶ THE PRINCIPLES *of action of various filtering materials differ and the methods used must conform to these principles.*

If sand is used, the liquids may be turned upon the top of the filter bed, from which they will percolate and wet the surfaces of all the grains and isue in an oxidized condition at the bottom drains. If broken stone is used, the liquids must be sprinkled over the surface of the beds or left in contact with the entire body for a sufficiently long time, generally by repeated applications, to get the same effect.

The recent advances made in oxidizing liquid sewage have not been great. A large field is still open for investigation, in order to obtain the greatest possible efficiency with the least cost under the usually variable conditions of practice.

Having now, as regards sewage disposal, covered the subject of nuisance, it remains, in closing, to mention the removal of dangers to health relating to such disposal. These dangers lie in the transportation to other points of pathogenic bacteria contained in the fresh sewage from sick persons and in the subsequent possibility of their once more getting into the bodies of human beings and higher animals.

Bacteria not only adhere to particles of solid matter, but remain in any liquid carrying them. It is possible that solid particles of sewage may be stranded in sewers, be held back and finally be blown away by an air current, enter the atmosphere and thus, by contact, cause a new infection. It is also possible that liquids may splash and throw bacteria into the air. In both cases the danger of transmitting disease is extremely small, if the sewers have smooth interior surfaces, no opportunities for eddies to form, and good grades to cause a rapid velocity from the sewage receptacles to the outfall, conditions which have been advocated for many years.

¶ HOW TO PREVENT *the dissemination of dangerous bacteria before they are destroyed by the purification processes used is an important problem.*

If the sewage is discharged into a sufficiently large diluting current of water, the pathogenic bacteria are gradually starved and perish. If the sewage is treated on land, there is some slight risk of transfer by violent winds. Generally the bacteria are either retained in and carried away by effluent water or are held back on the grains of the filter. In the latter case they eventually perish by exposure in the unfavorable environment, and in the former they can be at once destroyed by an inexpensive chlorine treatment such as is now for the same purpose given to most of our surface water supplies.

From what has been said above I believe that we have at last reached a stage of development in this branch of sanitary engineering, which enables us efficiently and economically to collect sewage at its sources, carry it to the outfalls and there dispose of it either in water or on land without causing offense at any point along its course and reduce to a minimum all danger to health.

# A NEW BUILDING MATERIAL

*Since natural clays first were used as building materials many thousands of years ago there have been few, if any, fundamental changes in the processes of manufacture. The first building brick was probably molded by hand and baked by the heat of the sun. Later artificial heat was employed to hasten the process of hardening. With the introduction of power driven machinery the process of molding was improved. Experience has pointed the way to superior methods of mixing and preparing the clay for manufacture. But the basic principle upon which brick and clay products are manufactured is essentially the same as that which governed the industry in its earliest stages.*

*This article describes a new process of making brick. The process involves a simple chemical combination of materials and the resulting product is stronger and more durable even than granite. It is fire proof, frost proof and sanitary. A factory for the manufacture of it is now under construction. The introduction of this process gives promise of marking the beginning of a new era in building construction.*

THE industry of making ceramic products or of molding clay or other earthy materials into desired shapes and hardening it by the application of heat was one of the earliest arts engaged in by man. It has been impossible to fix the date at which the use of such materials began. Pottery and building materials of clay composition are found in excavations revealing the earliest stages of civilization. The art was known to all races of people and on all continents of the earth.

Fundamentally the processes of manufacturing brick and ceramic products as practiced to-day have not been materially improved since their introduction. Improvements have, of course, been made in methods of mixing, molding and handling, and advantage has been taken of improved methods of developing power and heat, but the processes of manufacture still involve the selection of natural clay which possesses the property of hardening under the action of heat. The finished product of to-day is perhaps not superior to that of the ancients, and, in some respects, it may even be regarded as inferior. The present-day product undoubtedly does not possess the durability of the ancient product and does not always show the same degree of care and skill employed in manufacture. The brickmaking industry, as conducted under modern conditions, is somewhat stereotyped. A deposit of so-called "brick" clay is located and an empirical formula is developed, according to which the clay is mixed, molded and fired. While deposits of brick clay have been found in many localities, there are many sections of the country which do not possess them, the result being that the cost of good brick in such sections is extremely high, due largely to the expense of transportation. Altogether it may be said that the brick-

PILE OF TAILINGS *from a coal mine located on the property of the American Brick Company at Lincoln, Ill. End view.*

making industry has failed to progress in a degree comparable to the strides which have been made in other lines.

It is, therefore, a matter of unusual interest and importance to record the development of an entirely new process of making brick; one which is not dependent upon the presence of so-called natural brick clays; and one which may be employed in all parts of the country, and one which offers the most attractive commercial possibilities. Such a process of brick-making has been invented by Mr. A. Malinovszky, a ceramic chemist of long experience in the manufacture of refractory materials. The process has been perfected to a point of commercial practicability after long years of experimenting and has been protected by patents in the United States and foreign countries. A plant to manufacture brick according to the new process is now being constructed at Lincoln, Ill., by the American Brick Company, a two-million-dollar corporation, which controls the patent rights. A number of plants are to be built in various parts of the United States, and the activities of the company will be extended to foreign countries as soon as practicable.

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¶ THE PRINCIPLES *and the process of making the new brick are simple and the results are obtained more quickly than with other materials.*

The process utilizes a simple principle of combining chemically natural materials which may be found in abundance in many localities thruout the world. By-products of many industries may also be used. Briefly, it consists of mixing any coarse material containing silica with a binder of finely divided particles of alumina, silica and potassium or sodium in proportions which vary for the different substances and which may be determined in the case of each new supply of material by chemical analyses. One of the purposes of the process is to obtain a low fusing point for the binder and a relatively high fusing point for the coarse material. The material is molded, preferably dry, under high pressure, and is fired in a manner similar to that which is employed in the manufacture of ordinary brick. The process of firing, however, requires a much shorter period than is necessary in ordinary brick manufacture. The brick can be made in an ordinary down-draft kiln in two or three days.

Since the process was perfected many thousands of brick have been made with the use of various materials. The company has also made analyses of materials obtained from practically every state in the Union and from various locations in each state, a total of 260 such analyses of deposits having been made. Many samples of the finished product have been analyzed by various consulting chemists,

testing laboratories and geologists thruout the United States, and similar analyses and tests have also been conducted in Germany.

For the purpose of this article it will be sufficient to quote from the reports of a few of the scientists who have conducted the tests. Robert W. Hunt & Co., testing engineers, made some absorption, frost and fire tests on two sample bricks. The following is quoted from their report:

*Absorption Tests.*

"Two bricks submitted were carefully weighed and immersed in water for a period of forty-eight hours. They were then again weighed, with results as follows:

| Specimen marked | A-1 | A-2 |
|---|---|---|
| Color | White | White |
| Weight before immersion, lbs. | 5.109 | 5.172 |
| Weight after immersion, lbs. | 5.250 | 5.258 |
| Percentage absorption | 2.75 | 1.66 |

*Frost Tests.*

"The two bricks, A-1 and A-2, were directly from the absorption tests placed in cold storage for a period of forty-eight continuous hours at a temperature of 0 degrees—10 degrees Fahrenheit. After removal from cold storage neither showed any apparent indications of checking or disintegration as a result of the frost action.

*Fire Tests.*

"One-half of the brick A-1, after submission to tests above, was dried out and placed in a gas-fired furnace.

"During a period of five hours the temperature of the brick was increased to 2900 degrees Fahrenheit and maintained there for a period of one-half hour.

"After being allowed to cool with the furnace the brick was examined. The specimen showed some vitrification, but retained its form, and apparently was otherwise unaffected by the test."

A crushing test of the brick was conducted by Professors Talbot and Abrams, of the University of Illinois. Their findings are shown in the following table:

*Results of Crushing Test conducted at the University of Illinois.*

| Ref. No. | Color. | Weight, lbs. | Section, inches. | Length, inches. | Maximum applied load, Pounds. | Unit load, lb., per sq. in. Over | Remarks. |
|---|---|---|---|---|---|---|---|
| 1 | White | 5.5 | 2.25x3.90 | 7.95 | 565,000 | 18,200 | Loaded on sides. Cast iron bearing block broke at 565,000 lbs. Brick was apparently uninjured by this compressive load, altho it was broken at the middle as a result of the failure of the bearing block. |
| 2 | Buff | 5.5 | 2.18x3.85 | 7.90 | 607,000 | 19,900 | No result at maximum load. |

These bricks were tested in the 600,000-lb. Riehle testing machine. The faces were nearly plane surfaces. A cushion of three layers of building paper was placed between the loaded faces of the brick and the bearing plates. A hemispherical bearing block was used.

It is interesting to note that the No. 2 sample stood a slight excess above the capacity load of the testing machine, or a unit load of 19,900 lbs. per square inch, and showed no evidence of failure. Sample No. 1 was apparently uninjured when a failure of the bearing block of the testing machine occurred under a unit load of 18,200 lbs. per square inch.

Professors Talbot and Abrams also conducted an absorption test, results of which are given in the following:

| Reference number | 3 |
|---|---|
| Color | White |
| Weight, room dry | 2,387 |

| | |
|---|---|
| Weight, after drying 24 hours | 2,387 |
| After 24 hours in water— | |
| Weight | 2,389 |
| Water absorbed | 2 |
| Per cent. absorption | 0.08 |
| After 48 hours in water— | |
| Weight | 2,390 |
| Water absorbed | 3 |
| Per cent. absorption | 0.13 |

Weights are given in grams.

Absorption test was made on a whole brick, one 2-inch face of which had been polished. Before placing in water the brick was dried in a steam oven for twenty-four hours. After cooling it was placed flatwise in water to a depth of 1 inch in a covered pan. Before weighing superfluous water was removed with blotting paper. The balance used was sensitive to 1 gram.

Prof. Rollin D. Salisbury, geologist, University of Chicago, made a microscopic examination of several samples of the brick and submitted an article on the subject, the essentials of which are quoted in the following:

"In order to determine the real condition of the material within the brick a series of thin sections, eight in number, were made and examined under the microscope. These examinations showed that in all cases the baking had produced fusion enough among the materials used in the making of the brick to develop a glass (as in lavas), and that this glass serves as a binding material for the original grains which were not fused. These grains are bound together by the glass very much as the crystals of some igneous rock are bound together by the glassy (not crystallized) part of lava. In physical constitution, therefore, the brick is very like a very compact igneous rock which is but partly crystallized. The building material is adequate for strength.

"The texture of the brick is such as to indicate the possibility of a high polish, and the grain is so fine and even that clean-cut lettering and carving should be possible. The composition of the brick is such that lettering or carving should be as durable as in hard rock, and more durable than in marble.

"The materials used in the manufacture of the brick are so plentiful and widespread that there should be no difficulty in finding them in abundance in many places.

"The description of five of the slides follows. The other three are omitted, as they present no features not shown in the five described:

*No. 1—A medium-dark gray brick.*

"Under the microscope it is seen to consist of grains of quartz, orthoclase, magnetite and an altered ferro-magnesian mineral, in a glassy ground mass. This ground mass was developed in the burning and is the result of the fusion of parts of the substance of the brick. Pore space, about 11 per cent.; but it should be noted that this is not the amount of space that will take up water, for the pores are in the glass and not accessible

SIDE VIEW *of pile of tailings from coal mine, indicating supply of brick material available at this location.*

to water. The pore space into which water can penetrate is very small.

"The grains of quartz are angular (many) or rounded (fewer), apparently as they were before burning. They show little, if any, sign of corrosion. The corners of the angular grains remain sharp, but there appears to be a very thin film of clear glass surrounding each.

"The feldspar grains, both orthoclase and plagioclase, are much altered on the outside, and grade into the ground mass without sharp demarkation. The smaller grains are altered thruout. Under the microscope the original grains are seen to be broken up into extremely fine fragments, which are bound together by isotropic material. The effect of the heat appears first to have fractured the grains and then to have fused the material along the cracks. The little particles into which the feldspars are broken average about .002 mm. in diameter. There appears to be considerable kaolin, probably such as occurred in the original material from which the brick was made.

"The ferro-magnesian mineral is so much altered that its original character is not recognizable. But little of it is present. It is now altered to magnetite, surrounded by a brownish stain. It grades into the ground mass.

"The ground mass is of glass, filled with minute (about .002 mm.) particles of quartz and feldspar.

"The union of the original particles seems to be as complete as in extrusive igneous rock which contains some glass.

*No. 2—A white brick with a pink tone.*

"Under the microscope this slide shows more of the glassy base, and therefore less mineral fragments, than No. 1. The constituents are quartz, an altered ferro-magnesian mineral (rare), some magnetite, hematite, and much altered feldspar (?). Pore space, about 10 per cent. As in the preceding case, the pore space which water could enter is very small.

"The quartz appears in both rounded and angular grains, the former much more numerous than in No. 1. There seems to be a little more fusion effect in the quartz grains than in No. 1, for while the edges of the grains are not embayed by corrosion, there seems to be a thin film of glass around each grain, but this is not in all cases distinct.

"The feldspars are much more altered than in No. 1. The outlines of the original grains may be seen, but they are broken up into small granular aggregates, as in No. 1.

"There are little patches of magnetite and hematite, apparently indications of the former presence of a ferro-magnesian mineral. The original, however, is entirely altered. The ground mass is glass, as in No. 1.

*No. 4—Nearly white brick, with very few black spots. Whiter than No. 2.*

"Under the microscope very similar to No. 2, so far as shapes of grains and proportions of ground mass are concerned. The angles of most of the angular quartz grains are sharp, but in some cases there is clearly a reaction rim with the glass of the ground mass. The other principal mineral used, probably feldspar, is in most cases altered completely and mingled with the ground mass. Even the original crystal boundaries have in most cases disappeared. There is a little recognizable plagioclase. An original ferro-magnesian mineral is represented now by a stain of yellow and by aggregates of magnetite and hematite.

"The ground mass which binds the original constituents is glassy, but it shows the beginnings of recrystallization, for the glass is penetrated by numerous fine needle crystals, noticeable only with high powers of the microscope. This is a characteristic seen not rarely in solidified lavas.

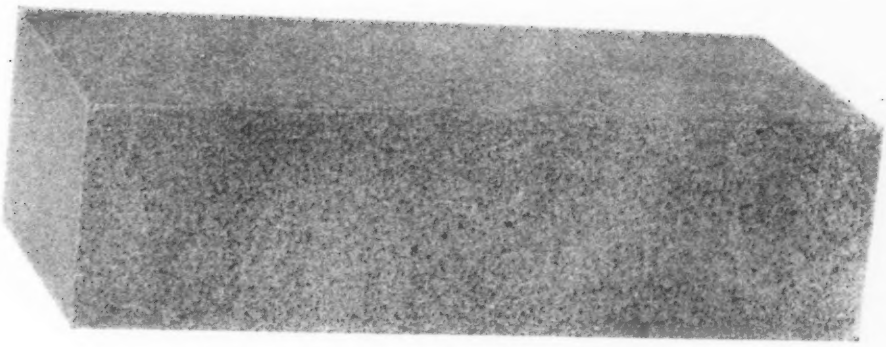
"Pore space about the same as in No. 2.

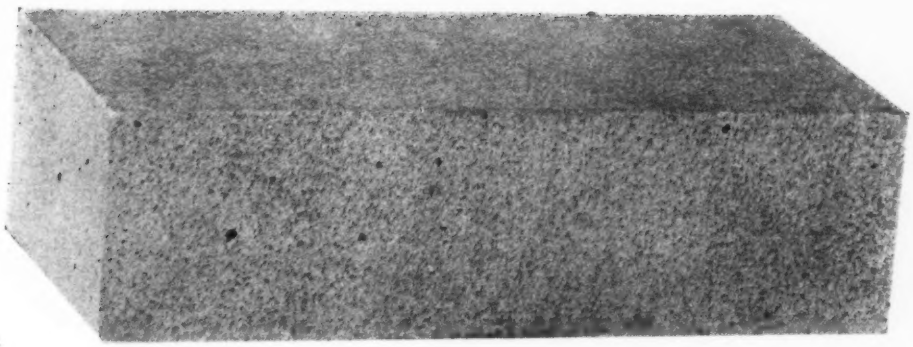
*No. 5—A mottled, fine-grained, red-white-black-gray brick.*

"Under the microscope it shows somewhat coarser material than in No. 1 and a smaller proportion of quartz.

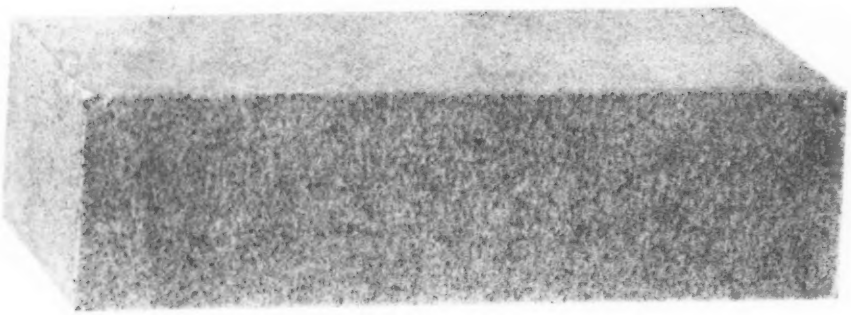
"Angular quartz grains show alteration rims of glassy material. Sharp edges are slightly rounded.

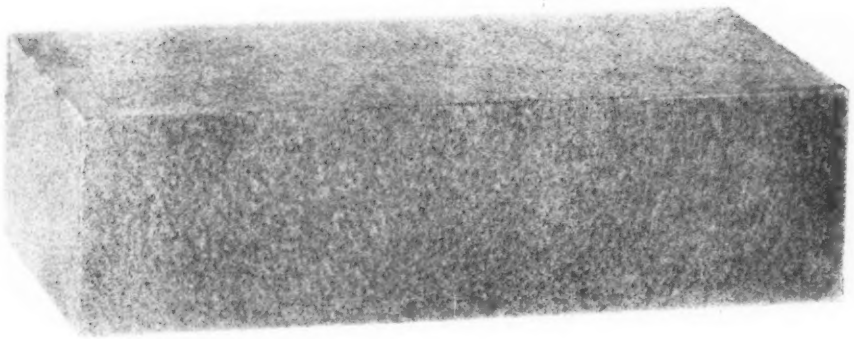
"Ground mass feldspar (?), granulated as in No. 1, but also shows recrystallization, with fine needles, as in No. 4. This recrystallization is much better developed in some grains than in others, suggesting



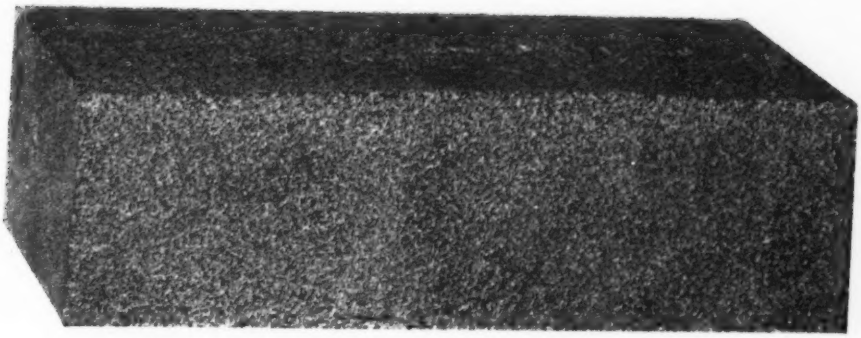


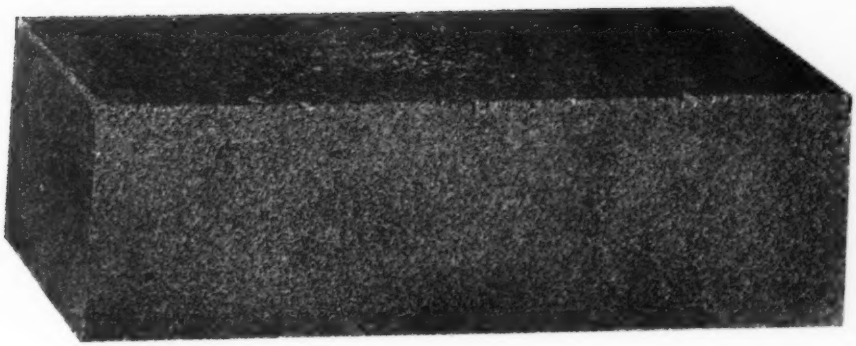
FACE BRICK, not polished, shown in true colors.



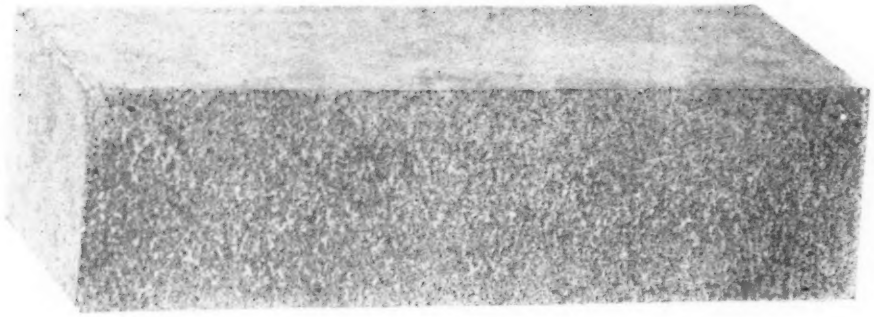


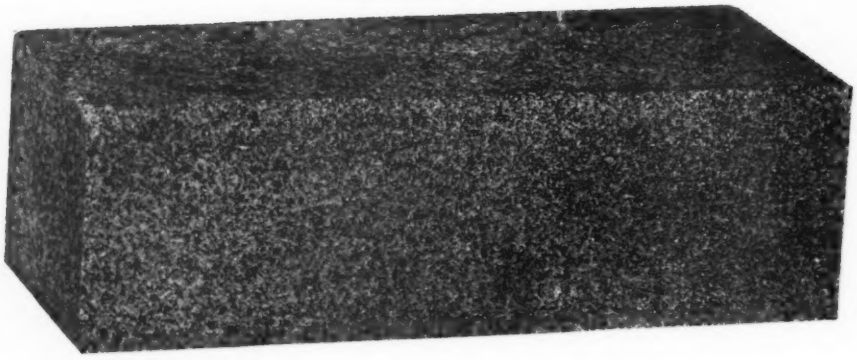
POLISHED FACE BRICK, shown in true colors. The structure is fine and the appearance more beautiful than French Granite.





ROSE TINT FACE BRICK, not polished, shown in true colors.





POLISHED FACE BRICK shown in true colors. The colors are as delicate and soft as those of an oriental rug.

that two kinds of feldspar may have been present. Some of the grains appear now only as a mass of glassy material shot thru with a felt of fine secondary needles.

"Iron oxide is much more abundant than in any of the preceding. It appears in the form of a yellow stain, as hematite and as magnetite. Kaolinization present in the feldspars, but this may represent the condition of the original material.

"The ground mass is clear glass, or glass full of grains and needles.

*No. 8—A yellowish brown, fine granular brick.*

"Under the microscope, similar to No. 1 in size of grain and in the relative proportions of ground mass, and included mineral fragments, but it contains more iron oxide.

"Quartz grains are rounded and angular. The angles are sharp, showing very little reaction due to heat. Granulation of the feldspar as in No. 1, but the outlines of the original grains are clearly recognizable. Not so much altered in the baking as Nos. 4 and 5; occasional plagioclase grains, hardly altered. Most of them, however, are broken up and grade into the ground mass as in the previous cases. There is much iron oxide occurring as a brown stain, and as grains of hematite and magnetite, scattered uniformly thruout the mass. There is greenish stain of chlorite, derived from some original ferro-magnesian mineral."

Prof. Dr. H. Seger and C. Cramer, chemists and chemical engineers, of Berlin, Germany, made an elaborate analysis and examination of samples of the brick. The essential facts brought out by their report are given in the following quotation:

"We received a sample of brick of a grayish white color with dark spots, and also a brownish sample.

"Results of the analysis were as follows:

"In determining the porousness it was found that the lighter sample of brick absorbed 2.8 v.H. (per cent.) of its dry weight of water, and the brownish sample 5.1 v.H.

"To determine the compressive strength we sawed cubes, 5.5 cm. long on the edge, from the samples, and analyzed these in the usual manner to determine the compressive strength, with the following results:

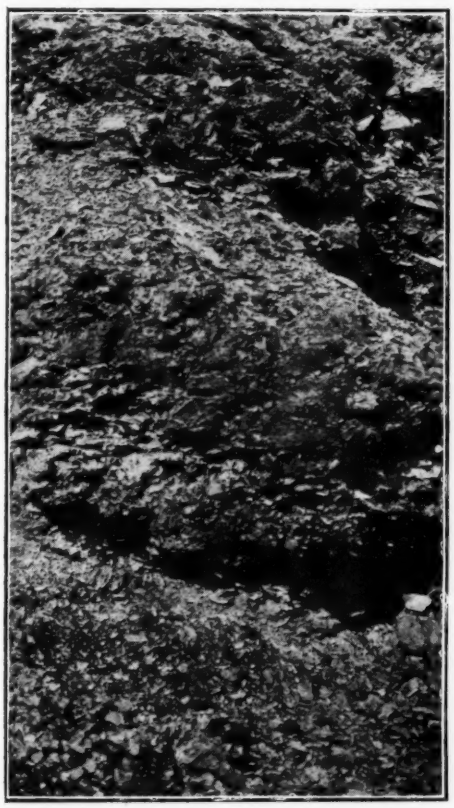
| *Lighter Sample.* | *Darker Sample.* |
|---|---|
| 1500 kg. per sq. cm. | 928 kg. per sq. cm. |
| 1392 kg. per sq. cm. | 782 kg. per sq. cm. |
| Average— | |
| 1446 kg. per sq. cm. | 855 kg. per sq. cm. |

"We then analyzed the samples for the purpose of determining their resistance to frost. This test proved that the brick does not scale.

"In the pyrometric determinations, which were made by comparison with Segerkegeln, the lighter sample began to melt with Segerkegel 13 and the darker sample with Segerkegel 13 to 14.

"The preceding determinations yield the following facts:

CLOSE VIEW *of material from which the American Brick Company will manufacture their product in their Lincoln, Ill., plant.*



"If the bricks sent to us may be considered as representative samples, the brick consists apparently of ground natural stone which has only a slight porousness and a high compressive strength; this is especially true of the lighter sample. The samples may be designated as impervious to frost. Their melting point is approximately the same as that of granite.

"The samples analyzed may be utilized for hydraulic structures, foundations, and for street and sidewalk paving."

It is interesting to note, in connection with the statement made in the Berlin report quoted to the effect that the melting point was found to be approximately the same as that of granite, that European granite or German granite possesses much higher refractory qualities than American granite. It is also of finer texture.

It is proposed in the Lincoln, Ill., plant now under construction to manufacture the new product from the tailings of coal mines, the material not being suited to any other purpose because of the high percentage of lime, sulphur and iron contained in it. The process, however, is such as to enable the use of this material with entirely satisfactory results. The presence of iron in a finely divided chemically combined state produces in the surface of the finished brick splashes of dark tan, which, on a background of light tan, give a most attractive and unusual appearance to the product.

Photographs of the material ready for use in the first plant are presented herewith. It contains approximately 200,000 tons of usable raw material.

The brick takes a very high polish, and when polished presents an appearance very similar to that of granite. It is, however, of closer grain than granite, a characteristic which will probably enable it to retain its polish for a longer period than granite. Photographs of several samples of the brick, reproduced in true colors, are presented herewith.

Mr. A. Malinovszky, who has worked out and perfected the process, was born in Austria in 1875. He comes from a family of ceramic specialists. His early life was spent at work in his father's pottery factory. He came to America in 1903, and since that date has done a considerable amount of special work in pottery factories, in the Edison plants at Orange, N. J., and in the plants of the General Electric Company, at Schenectady, N. Y., in the latter of which he was engaged in the insulating department.

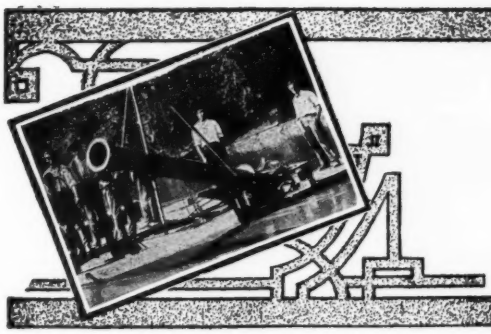
The president and active head of the American Brick Company is Mr. H. H. Randolph, a young man of broad business experience and unusual energy and capacity. He was formerly engaged in the investment banking business in the city of Chicago, and gave up a well-developed and profitable business to devote his entire attention to the interests of the American Brick Company.

The engineering work in connection with the development of the plans for the machinery and the plant layout has been done under the direction of Mr. J. E. Boynton, formerly with the Arnold Company, Chicago.

The American Brick Company is a Delaware corporation, having a total capital stock of two million dollars. Subsidiary companies have already been organized in several of the states to handle local territory.

Carefully prepared estimates have been made of the cost of producing the new product. These indicate that it will be possible to place it on the market in competition with any of the high-grade face brick now available.

A detailed study of the process and of all facts bearing upon the commercial aspect of the problem makes it evident that this new product will take a most important place in the field of building materials, and that its introduction will result in the development of many new types of construction which are not now possible with building materials in common use. The new product can be made in any desired shape and of practically any size. The American Brick Company has already developed plans for new types of construction, and these possess so many attractive features as to recommend them at once to structural engineers and architects.



# EDITORIAL

## THE NEW SIZE OF MUNICIPAL ENGINEERING.

For twenty-five years MUNICIPAL ENGINEERING has been published in magazine form with a printed page approximately 5 inches by 8 inches. In recent years there has been a commendable tendency on the part of publishers to standardize the size of publications. In the technical and trade field a size of 9 inches by 12 inches with a printed page 7 inches by 10 inches has become standard. The next issue of MUNICIPAL ENGINEERING will be of this standard size.

Before deciding to make the change the opinions of many readers of the publication were secured. These were overwhelmingly in favor of the new size although a considerable number felt that the present smaller size possessed some advantages and conveniences which the larger size did not have. The change has been decided upon in order to meet the wishes of the majority of the readers.

MUNICIPAL ENGINEERING will also have a new cover design for the new size. It was the first publication in the engineering field to use the full page half tone cover which is now used by a number of publications. The new cover design will be as unusual, distinctive and attractive as the old design was when first used about three years since.

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## CHEAP STREET TRANSPORTATION

The jitney bus, the operation of which is analyzed on another page, has frightened street railways in the cities where it is making inroads on their daily receipts, and Cleveland newspapers seem to be frightened in advance at the prospect of interference with the income from 3-cent fares, in which case fares will increase automatically when the reserve fund reaches its lower limit.

In general it is probable that these fears are not well grounded, tho there may be a few cities under special conditions, such as Los Angeles, at almost any time, San Francisco and San Diego during their expositions, and others in which street car service is poor or not sufficiently extended in which the service will be permanent.

The first jitneys were started in consequence of a strike, when their success was certain. Unemployment of some automobile owners and the congestion in street railway traffic at certain times of day induced taking up an occupation which had success behind it. The success of one led others to enter and the consequence is a flood of the new transportation facilities.

There are plenty of computations to demonstrate that the business cannot support itself continuously, except, possibly, with very cheap, second-hand machines on routes not crowded with busses, where the last wear is gotten out of the machine and it is worn out by the time it is paid for.

Plenty of work will draw off most of the present owning operators of jitneys. The wearing out of the machines will stop the lines started by automobile garage owners and over-crowding of routes will discourage others. The better times toward which we are now evidently traveling will, in short, cut the business down to a minimum.

It is probable, however, that there will be a certain amount of the business in some cities during the rush hours of mornings and evenings so long as there are autos not otherwise engaged at those hours, whether owned by private parties or by garages or taxicab companies. The street railways may therefore expect a reduction in the over-crowding at the rush hours, which will be welcome to their patrons, so that what is the loss of one is the gain of the other. The effect upon street railways charging less than a five-cent fare will be much less appreciable, and Cleveland's 3-cent fare will probably make the jitney bus competition practically negligible. The average ticket buyer on a street railway will think some time before he will regularly pay five cents for what he has been accustomed to get for three or four.

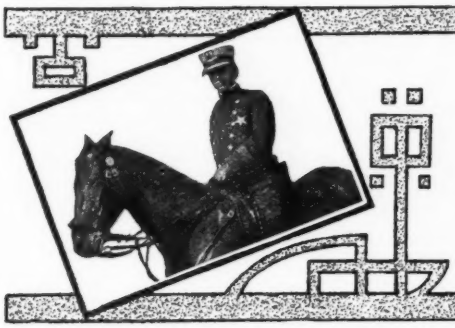
## CITY MANAGERS

The communication on city managers in the west in the department "From Workers in the Field," shows that charter-making without careful study and advice from experts is likely to bring the city-manager plan into disrepute even in the homes of its friends. It is necessary to mention but one subject to show how personal preference by those influential in preparing the city charters have fixed provisions with little real knowledge of the effect those provisions may have.

The method of discharge of the city manager is one of the points upon which there is the most difference of opinion. It seems to be difficult for the average charter maker to see that he cannot have the independence of action which goes with responsibility at the same time that he keeps the control of action directly in the hands of the voters. He does not see that he cannot get a really competent and honest man for an office from which he may be removed at any moment on account of the caprice of a man, a board, or an electorate. Practically all of us are so thoroly imbued with the idea that politics is rotten and that it cannot be kept out of municipal affairs, that we are not willing to try the experiment. The consequence is that we have certain peculiar provisions contained in the charters noted in the communication referred to.

If we will follow the principles which have demonstrated their success as carefully as we are trying to get away from those we feel are failures, we will soon begin to see some improvement.

The cities having the commission form of government are trying to follow one of these principles, that of nonpartisan nominations and elections; the city of Dayton is trying to follow another, the merit system, tho a real merit system can not be fully in force until there is sufficient demand for skilled municipal employes to warrant men in preparing themselves for such positions; the state of Ohio and some of the western states are trying the third principle, that of home rule, tho the Ohio plan may be overturned in part at least by the legislature at any time. Home rule will not be safe until it is impossible for a man, who cannot do what he wishes with the city government, to go to the legislature and procure a change of the city charter which will give him the authority he wants in spite of the desires of the people of the city.



# QUESTION DEPARTMENT

## Franchise for Electric Light and Power Service

Our town has been approached by one of the hydraulic power companies for a franchise with a thirty-year contract for light and power, with specified rates. We have had an unpleasant experience with an oil engine which is being discarded for a steam plant, and which will be ready in two or three months. Our steam plant will have a 150-h.p. engine with two 125-h.p. boilers.

We wish to obtain information as to the rate for light and power, the cost of operation and all the statistics necessary for arriving at average and reasonable rates and a fair contract for towns and citizens situated as we are.

If such information has been published in recent numbers of MUNICIPAL ENGINEERING, please refer me to it.

S., ———, Tenn.

In the February number of MUNICIPAL ENGINEEIRNG, vol. xlviii, p. 89, will be found an abstract of a franchise for electric light and power and water service which is in most respects modern and provides for modifications of rates at intervals in case this is desirable. Rates for electric current and electric service have changed so much in the last thirty years and the developments in electric lighting are now so rapid that no contract fixing rates for thirty years, or even for ten years, should be made by a city.

In this number of MUNICIPAL ENGINEERING will be found another article giving a method of paying for street lighting which is very attractive because at the same time it provides for any improvements in fixtures which the city is willing to pay for and removes any uncertainties as to relation of service to payment for it, which should be of benefit to both parties, but probably of most benefit to the city because ordinarily the company knows much better what it is doing in making a contract than do the city officials.

Such a contract as that considered should be worked out with the advice of engineers experienced both in electrical engineering and in franchise construction. They may be able to save the city and the private consumers many times the amount of their fees, and will do so unless the company is much more public spirited than corporations are wont to be.

This is particularly true since it is proposed to abandon a municipal plant now about ready to run. It is quite probable that a large hydraulic plant can furnish electric current at a lower rate than a small steam plant, and in that case it is good business to purchase the current of the company. Again, it may be better for the city to purchase current and distribute it to its citizens, or it may be better to contract with the company to distribute as well as supply the current. These are questions on which the advice of the expert electrical engineer should be sought.

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## Bituminous Streets Damaged by Street Flushing

Can you advise us of any tests made of the actual extent of damage done to pavements of a bituminous composition by water used in flushing the streets? The general opinion seems to be held that water, especially water under pressure, is damaging to the pavements; but just to what extent we have been unable to learn. Any facts you may be able to give us in this matter will be greatly appreciated.

N., ———, Cal.

A paper on "Street Cleaning Methods and Results," in MUNICIPAL ENGINEERING for September, 1914, vol. xlvii, p. 176, gives satisfactory and unsatisfactory methods of street flushing, showing that good methods produce good results.

Satisfactory machinery for flushing streets is described in articles in vol. xliv, pp. 57, 160, 284, 439; vol. xliii, pp. 118, 344.

An article on "Cost and Efficiency of Street Cleaning Methods," vol. xl, p. 32, gives figures of cost for various methods, including flushing, and references to earlier articles giving further figures. Another list of earlier articles will be found on p. 427.

Articles opposing the practice of flushing for cleaning streets will be found in vol. xl, pp. 131 and 132, and vol. xxxix, p. 316.

The writer's observation is that machines with flushing streams properly distributed and directed and using pressures not too high are no more destructive to pavements than are dry or sprinkled broom sweepers, but that hose flushing as ordinarily practiced and badly designed nozzles for flushing machines may be very destructive.

Can our readers give any comparative figures regarding flushing as compared with other methods of street cleaning as to effects on pavements?

## Ordinance Creating City Forester

We have a request from an Indiana city for an ordinance creating the office of city forester. We do not know whether in Indiana the municipality has power over its trees under charter authority, or by virtue of a state law, and we therefore would like to have you refer us to an Indiana city that already has one in effect.

T., ———, Chicago, Ill.

The city of Indianapolis has a city forester provided for under its park law, which does not require an ordinance to put it into effect. The provisions of the New Jersey act of 1893, with its amendments, is an excellent basis for an ordinance governing a city forester, tho it provides for a commission with a forester acting under it. Can our readers send copies of such ordinances now in operation?

## Specifications for Automobile Fire Apparatus

We have a small city which covers a large amount of territory, considerable of it beyond our water mains. Our water mains are old and very frequently we have leaks after we have been compelled to put on extra pressure during a fire. We have paved streets leading in nearly every direction towards the limits of the city, but most of our streets are sandy.

Can you give any information about what we ought to require in the way of a motor-driven hose cart, and also the cost of same?

Can you also give me any information about what advantage it would be to the city to have a pump as part of the apparatus, considering the condition of our mains and also our streets?

Our central fire station is in the center of the city. Pressure at the pump house normally is about 45 pounds higher than pressure at the central fire station, on account of difference of elevation. During fires the average pressure at the fire station is 60 to 65 pounds,occasionally going as high as 75 to 80 pounds in bad fires.

H., ———, Minn.

Real answers to these questions could only be given after a careful personal examination of the local conditions. It is evident that the water distribution system needs improvement and extension. Within the area covered by the water pipes a combination of pump and hose would be very valuable on the motor, as it might not be necessary to overstrain the water pipes by putting on full fire pressure. Outside this area the pump would be of use in reaching houses now nearly or quite out of reach with the pressure in the mains.

Pending the improvements in the water system the combination machine would, therefore, seem to one not familiar with the locality to be very desirable.

Can any of our readers send specifications for the class of machine they have purchased for use under similar conditions? Specifications throwing the competition open to all makers of satisfactory machines are, of course, preferred.

## What Is El Oso Asphalt

Will you please inform me as to the nature of paving asphalt called "El Oso"? I would like to know its origin and any other information about it. SUBSCRIBER.

This is a name given to an asphalt for for paving purposes which has been used at lettings in several different places and seems to be given to a California asphalt. Will any of our readers give information about it? The writer has a sample of bituminous macadam pavement from Wellington, Kan., which is called "El Oso Pavement."

## Strains in Pavements

The writer is informed that you published in one of your issues last spring some information about tests of vibration of pavements conducted by the Bureau of Public Roads.

G., Consulting Engineer, New York.

"Temperature Strains in Brick Pavements," by James E. Howard, engineer-physicist, U. S. Bureau of Standards, Washington, D. C., is possibly the article referred to, as the experiments described in it had the co-operation of the Office of Public Roads. This article appeared in vol. xliii, p. 381, December, 1912.

## Dust Laying on Streets and Roads

I would like a report on water-bound macadam and the laying of dust and the best means of doing it on street pavements that require something besides water.

A book by Prevost Hubbard on "Dust Preventives and Road Binders" ($3) gives full information on all classes of dust preventives. Probably the class of temporary binders is the one referred to in the question. This includes water, sea water, calcium chloride, sodium silicate, tar, vegetable, animal and mineral oils, particularly semi-asphaltic oils, glutrin or prepared waste sulphite liquor, and other waste products, such as molasses residues. The book gives full descrip-

tions of all these materials, specifications for their quality and use, and methods of applying them.

The U. S. Office of Public Roads, Washington, D. C., has issued several progress reports of experiments in dust prevention and road preservation, which give the practical results of the use of several materials used for such purposes.

## Information on Regulation of Street Traffic

I would like to have numbers of MUNICIPAL ENGINEERING containing articles regarding street traffic and its regulation.
C. H. P., Philadelphia, Pa.

Following are the most recent articles on this subject:

In vol. xlvii: "Ordinances Providing for Vehicle Licenses," p. 124.

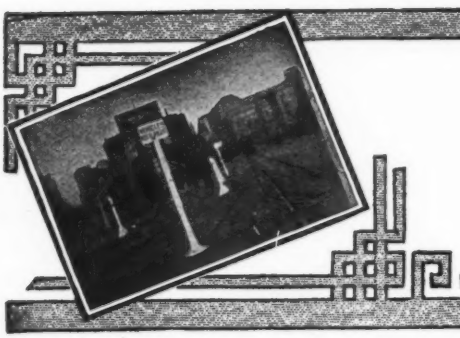
In vol. xlvi: "Ordinances Governing Street Traffic," p. 117, also vol. xliii, pp. 38 and 388; "Congestion of Traffic on Fifth Avenue, New York," p. 433; "Regulating Standing of Vehicles in the Street," p. 123.

## Berkeley Park Bathing Beach, Denver, Colo.

The Berkeley Park bathing beach in Denver, Colo., is one of the more recent developments of this sort in the city, and is not yet fully worked out, but the natural beauty of the location, as evident from the photograph, and public favor and demand will soon produce the necessary improvements. The bath house is thoroly modern, with eight shower baths and constant supply of hot water. The women's dressing rooms have four showers, a sun bath, twenty dressing booths and 150 lockers. The bath house and beach are operated by a concessionaire, who pays the city $1,000 a year for all the park concessions. Suits were provided last year for 600, but on Saturday and Sunday afternoons as many as 1,500 have enjoyed the bathing, many supplying their own suits.

The supervisors of the Denver playgrounds encourage playground leaders to use the pools for their groups of boys and the Berkeley playground leaders offer swimming lessons each day in the season, from 11 to 12 for little girls, from 2 to 3 for small boys and from 6 to 7 for older boys, all under the care of life guards and with all possible precautions against accident. A life-saving class is also conducted, teaching the use of the pulmotor and various methods of rescue and resuscitation.

BERKELEY PARK *bathing beach, Denver, Colorado, one of the playground accessories, which is extremely popular with the young of all ages. Improvements are made on it each year.*



# WORKERS IN THE FIELD

## Dayton's Effort at Solving the Problem of the Unemployed

The Editor of MUNICIPAL ENGINEERING:

Sir—The general business depression during this winter found many worthy people without work. Some factories were running short time; all had lessened the number of their employes. The merchants suffered, as every one curtailed expenses. A bond issue of $250,000 for extension and reinforcement of the water system had been passed. Fifty thousand dollars additional was available, as this amount had been saved on water works construction done by the city employes during the past summer. This meant over $150,000 available for pay-roll purposes as soon as work was started, tho the pipe, valves and special fittings had not been ordered, as this work was to have been done after the weather opened up.

City Manager Waite gave orders that work would be commenced on Monday, December 21, this order being given the previous Thursday. It further called for the employment of 200 men, or as many more as needed the work or could be handled. Fortunately the contract for the pipe had been placed and the foundry was called on long distance and asked just what they could do. The result was pipe inside of four days and special castings for bonds, crosses and the like as soon as these could be completed. Notices were posted for all wishing work to appear.

Tags were prepared with serial numbers and districts stamped on same. (District A, 1843, for example.) These were given to all who applied at the office. Advice was furnished and notices posted for all to report at respective jobs called for on these numbers. As many men as could be handled were taken on the first day and the rest advised to come back in rotation as called for by the numbers issued. The men were paid off each day, and if their work had been satisfactory a new ticket with a number which put them at the bottom of the list was given each man. The majority of the men did most excellent work. It meant earning money for food instead of want or charity. They appreciated it and the effort the city was making to help them out. Cost sheets showed some of the work to have been done, with ground frozen eighteen inches deep, by men foreign to the business, for less money than that done by the old construction gangs under previous management. It was simply the American man doing his best and overcoming the obstacles.

The system furnished money for food, the men at first getting an average of one day's work in six. Almost every afternoon, as the men were paid off, many had either wife or child present with a market basket, and the money would immediately be turned over to purchase food. A number of days the men were paid off near saloons, and, in spite of weather as cold as 15 degrees above zero, no money appeared to go for liquor.

The pay roll was handled by a timekeeper who visited the jobs, took the men's names and inspected their numbers. With this data he and the chief clerk of the department of water made up the pay-roll. As the men changed each day, it was either a case of having them make an extra trip or else pay them that evening. The latter meant the easier for the men, so each afternoon the superintendent, who issued the work tickets, the cashier and the time keeper made the rounds. On reaching a job the foreman went through the gang with the pay men and each man received his $2 on receipt of his number and name, which was checked. After paying the men the foreman certified the men as having been paid, after first seeing that his own time book checked with the pay-roll. For six weeks we have paid daily from two to three hundred men, at places requiring over ten miles of driving in a small Ford car, and have never taken over two hours or held the men more than ten minutes over their eight hours.

The system was taking care of a thou-

sand men and doing a good work. The money paid went directly into circulation again and so worked many times. However, the system could be beaten, and men were doing it. In the first place, some men were not satisfied with work every four days and wanted more, and so worked two tickets at the same time, no check being provided over their issuance. In the second place, men who did not belong in Dayton obtained work, and so made less for the real Dayton men. The third problem was the foreigners, who swarmed after work.

The foreign problem was solved by allowing the foreign labor agencies and the foreign churches so many tickets each day. The repeaters were taken care of by simply catching the faces at first and putting them off the job for good, and later by checking each man's record. The third was taken care of at first by looking each man up in the city directory before giving him a ticket. Foreigners with property or naturalization papers were allowed to work. The idea was not to discriminate against them, but merely to help the men with families who needed it the most.

In order to reach those most needy, cards were gotten out containing the following information:

Name..... Address.....
Age..... Number Dependent.....
Occupation..... Last employed by.....
Time out of work.....

—To be filled out by Police Officer.—

Above satisfactory.....
Need Work.....
Time in Dayton.....

The card as indicated is filled out by the man and a number is given after the police officer has reported, which takes one day. A clerk in the office goes over each pay-roll and enters up the job the man works on, the date and the number used for the work. Also the report of the foreman as to nature of work done, the letters F, G, or P indicating whether the work was fair, good or poor. If a man gets two P's he is transferred to some other foreman, and if he again gets the two P's he is relieved from work. The actual work done is not considered as much as whether the man tries. We get old men who can not do the work and still need the money. The effort is what really counts.

Since the gang has been weeded out, we are giving one day's work in four. The men are posted as to their turns by bulletins issued daily and posted on the jobs and in the office, which show what is the low number to be called and the number of men that will be worked. That way men know when their turn comes without being there every morning, and so have chance for seeking better employment or doing other odd jobs.

The system is simple and it helps the men. The money goes into circulation at once and helps Dayton. One pipe gang laid twenty-six 12-foot lengths of 20-inch pipe in eight hours, all of which tested O. K. on the joints, so it is evident that the benefit is mutual. The work was started without knowing just how it would turn out and before a system was perfected. However, if every town would get the idea and go to it, the era of prosperity hoped for would be hastened.

H. C. WIGHT,
Superintendent, Division of Water,
Dayton, O.

## City Managers in the West

The Editor of MUNICIPAL ENGINEERING:

Sir—Following the installation of the city manager in Dayton, Ohio, cities and towns of the west became alive to the opportunity for advancement in municipal science. In a hundred places municipal officials and business men appropriated the good ideas that sifted out of Dayton and planted them as seed from which have grown the excellent systems now in vogue in a number of these places.

Montrose, Col., prepared to throw off the aldermanic form of government at the earliest possible moment, and early in 1914 the commission form was substituted with provision made in the charter for the position of city manager. The Montrose charter has been considered a model among towns of several states.

The Montrose charter, among other things, embraced initiative and referendum and recall provisions, and, while it gave the commissioners power to discharge the city manager, it also provided that the city manager should be subject to recall. While the framers of the charter looked forward to a much improved form of government that would be honestly and efficiently administered, they took no chances of having a contrary commissioner refuse to discharge a city manager if he was found dishonest or incompetent. The commissioners may elect the city manager by a majority vote, but can not discharge him except upon a unanimous vote. In that connection a clause of the charter is interesting, in that it gives the mayor the right to vote but deprives him of the right of veto. The Montrose charter clings closely to the old-time fundamentals of city government, but it embraces a lot of new ideas about management and details.

The Amarillo, Texas, charter calls for a standard of efficiency in the city manager that is extraordinary, for he may be oust-

ed from office over night. More than that, it provides that he "shall be the administrative head of the municipal government, and shall be responsible for the efficient administration of all departments. "Like most of the other late city charters this one prohibits the city manager from employing relatives in the service of the city. This charter steps out of the beaten path in another particular: It provides that the city manager nor any other person in the employ of the city must not accept free passes to theaters and other kinds of shows nor "accept a personal favor of any intrinsic value from any person, firm or corporation with whom he transacts official business, when such favor would be in recognition of his official position."

City Manager Hardin, of Amarillo, first suggested the idea of a congress of city managers. But that idea was second best among a number of ideas that have made Amarillo one of the best governed towns in the country. His best idea was that there should be a board of city development, and it bore fruit. A few months ago there was organized there the first municipal board of the kind in the United States. This board embraces twelve departments, each with a separate head. A secretary and an assistant secretary are employed full time to look after the business of the board. "In other words," says Hardin, "it is a chamber of commerce organized as a part of the city government and supported by all the people, and it works."

"My plan has been to eliminate all unnecessary help," says Manager Hardin, "and to require of every man employed a full day's work. But we have given men sufficient pay to make them like the work and take a pride in being a part of the city machinery. We have no old men on the city pay-roll and no pensioners."

The commissioners of Collinsville, Okla., and Abilene, Kan., being at the head of city governments where many municipal improvements requiring the service of an engineer were to be made, looked well into the engineering records of their applicants for city manager, and they probably have chosen two of the best that were available, if the accomplishments of these men are an index to their qualifications.

City Manager H. B. Schwartz of Collinsville was an engineer by profession, having begun his career in machine shops in Marion, Ind. He built the first light and power plant at Bartlesville, Okla., and was its superintendent for six years. He had also two years' experience in city government as a member of the City Council of Bartlesville. In 1912 he was employed as superintendent of the municipal light and water plant at Collinsville when it was earning a revenue of $240 a month. Under his management in less than two years it was earning a revenue of $1,700 a month. Later he acted as engineer for the city and made a saving of $2,000 engineering fees in making extensions to the light and water system and building a city hall. He has made a saving in every department of the city government, established efficiency and cut out the waste.

There seems to be no end to the powers and duties of the average city manager in this section. The charters are all about alike in this respect, but probably Abilene, Kan., has a slight lead. Here are the duties of City Manager Kenyon Riddle of Abilene:

To see that all laws and ordinances are enforced; to attend all meetings of the commisison, with the right to take part in the discussion but having no vote; to recommend to the commission for adoption such measures as he may deem necessary or expedient; to give all lines and grades for city improvements which require the same; to have control, management and direction of all improvement work of any nature which pertains to and comes under general engineering principles; to be inspector of all wiring, sewer connections and chimney construction; to approve all estimates of the cost of public works and recommend to the commission the acceptance or rejection of the work done or improvements made; to recommend to the commission the appointment or **removal of all heads** of departments and all subordinate officers and employes of the city which come under and pertain to principles of engineering; to exercise control over all departments and divisions created by the commission; to keep the commission fully advised as to the financial needs of the city, and to draw his salary.

Manager Riddle has prepared a symposium relating to the duties and qualifications of the engineer-manager. "The manager," he says, "should be without extensive interests in the community which he serves. This makes it possible for him to give impartial views in matters concerning employment of labor and purchasing material.

"His preparation should consist in a thoro education along the lines of general engineering rather than of a knowledge of a few special branches. He should have an understanding of values and be able to estimate all classes of construction and maintenance work, be economical and able to establish systems of record keeping and cost data and have a general conception of business methods and finances.

"Some of the dissipation of tax money is due to graft, etc., but most of it is the

result of poor management, lack of harmony among the board members and a lack of knowledge along particular lines, especially in the engineering department of smaller towns and in the purchasing department of nearly all municipalities. Therefore, in consideration of the small towns, the main object in order to secure efficiency where it is most lacking is to devise some scheme whereby the town can feel justified in having the services of an engineer at all times, and this remedy lies in the engineer-manager plan.

"With the engineer-manager it is possible to get the very best and most active business men to serve on the commission, since their duties are reduced to a few hours a week. Furthermore, it is generally admitted that the holding of a political job is not a successful means of increasing one's business, but under the new plan all complaints and grievances may be put up to the manager. By hiring a manager the hindrances of politics are eliminated and professionalism is substituted."

W. F. KERR,
Oklahoma City, Okla.

## Motor Snow Plow and Sweeper

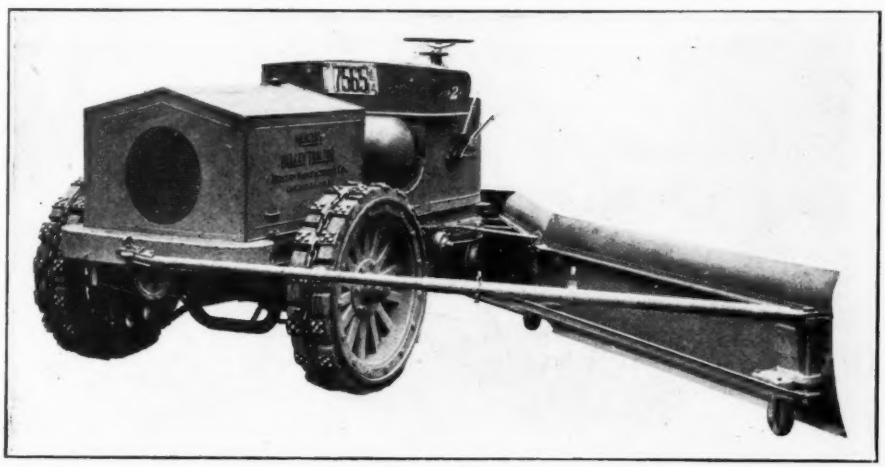
The removal of snow from city streets and drives is a costly but necessary procedure, and every hour's delay not only makes the final removal more troublesome and expensive, but adds to the difficulties of road vehicle operation. Every inch of snow decreases the efficiency of horse-drawn equipment, and the longer it remains on the streets the greater is the loss to merchants with deliveries to make and the more seriously is the public at large inconvenienced.

Were it possible to quickly plow out a roadway and bank the snow to the curb or in the center of the street, the final removal could be made more cheaply and traffic delays would be greatly reduced. If the street car companies did not send out electric sweepers as soon as there were indications of a heavy snowfall, the lines would be hopelessly blocked in a few hours. To do the same for the lines of other vehicle traffic motor-driven snow sweepers and snow plows must be used. The power unit must be compact, sturdily built, easily manipulated, capable of securing traction on any kind of snow or ice-covered street without injury to the pavement, and of sufficient power to break up frozen drifts. A tractor with these qualities can push the snow plow, a rear view of which is seen in one of the photographs, or draw the sweeper seen in the other.

The snow plow resembles the very effective railroad plow more than the ordinary road scraper quite generally used. In the road scraper there is a single blade set at an angle, slightly curved and rigidly attached to the vehicle, but capable of being adjusted vertically by the operator, and in some cases a change of angle is possible. The plow shown in the photographs is flexibly attached to the power unit, rests upon its own wheels, and is free to articulate and conform with the road surface, regardless of the position which the tractor may assume.

The V-shaped main member in front is properly formed to lift and displace the snow to the best advantage, and an arm eight feet long is attached to the right-

REAR VIEW *of motor snow plow, showing method of flexible attachment of extension blade carried on two small wheels.*



hand rear of the V-shaped piece, which is easily adjustable so as to increase or decrease the throw of the plow. The main member may be used without the extra arm. The rear ends of the main member are supported on two caster wheels, and the front on a flanged guiding wheel, mounted on a fork and turned by a gear and wheel arrangement directly attached to the tractor steering turntable. The framework is of heavy channel and angle iron, riveted and welded together. The heavy bent plates forming the blades are riveted in place and reinforced by channel-iron ribs and angle-iron lengthwise members. There is less than than one-half of an inch clearance between the plow and the ground, which insures a clean street. The V end is fitted with a strong prow, so that when an obstable is met which cannot be plowed aside, the plow either mounts over it or sheers to one side.

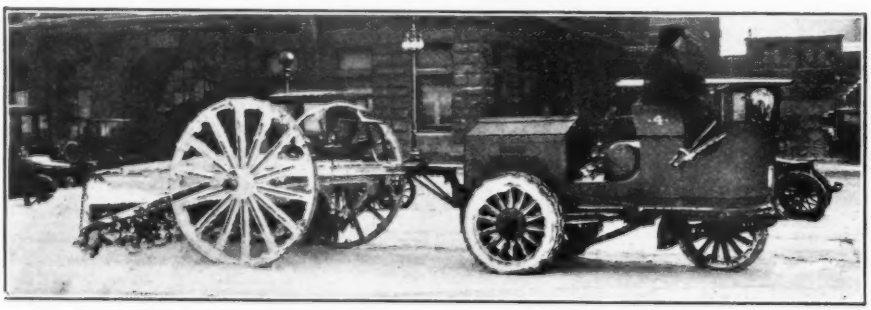
The snow plow is attached to the tractor at three points, but none of the connections are rigid. A detachable forging is fastened to the front of the tractor by two bolts and thru a hole in this forging the vertical driving post of the snow plow passes. The rear end of each side of the main member is flexibly attached to the tractor frame by a bent round iron passing thru a swivel bolt. The flanged guiding wheel, located just behind the point of the plow, is actuated by two heavy steel wire cables attached to the tractor steering turntable.

The extra plowing arm may be attached to the rear end of the right side of the plow by a long swivel bolt. The rear end of this extra arm is supported on a caster wheel and connected with the rear of the tractor by a braced, telescopic extension rod. The length of the rod can be quickly adjusted to give the extra arm a throw of from nothing to six feet.

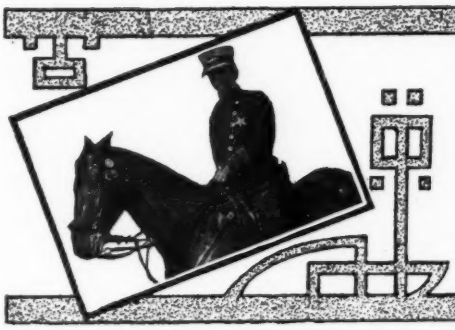
When entering a wide street the plow first opens up a furrow from 8 to 14 feet wide, depending on whether the extra arm is swung open or not, then it returns on either side and banks the snow against the curb.

Two of the tractors, one equipped with the snow plow and the other drawing a snow sweeper, as shown in the photographs, were used in cleaning Michigan avenue, Chicago, during the heavy snowfall January 20 and 22. With suitable approaches they mounted the wide sidewalk along Grant Park and first plowed out a passageway and then swept the walk clean. When the snow first began to fall, the motor-drawn sweeper cleaned up the avenue easily, but the storm increased and the plow went to work, first opening up a passageway, and then banking the snow at the curb and also in the center of the street. The sweeper followed and left clean pavements for the automobiles.

MOTOR SNOW PLOW *clearing park driveways of deep snow. Note ease with which it handles the snow.*



MOTOR SNOW PLOW *drawing a sweeper to clear the pavement after the plow has done its work.*



# LEGAL DECISIONS

## Decisions of the Higher Courts of Interest to Municipalities

City Must Supply Water at Same Rate to All.—A city which constructs, as authorized by statute, a water supply system for its inhabitants and for territory outside the limits, must furnish water to all consumers, whether within or without the city, at the same rate, in the absence of some physical difference justifying a separate classification of those consumers who reside outside the city limits. City of Montgomery v. Green et al. (Ala.), 65 So., 783.

Alley May be Appropriated for Parkway.—Where the state conferred its full powers of eminent domain upon a municipality which power applies to every species of property, except as limited by the state and federal Constitutions, the municipality may condemn a public alleyway for a parkway, for the municipality already owns the public easement, and the private easements of abutting owners are private property subject to condemnation. Chaplin v. Kansas City et al. (Mo.), 168 S. W. 763.

Harrisburg Filters Do Not Infringe Patents.—The Jewell reissue patent, No. 11672, for a filter for municipal or other large waterworks plants, and the Jewell patent, No. 644137, for the method of purifying water by the use of such filters, held not infringed, on uncontradicted evidence that experiments conducted during six months with the alleged infringing filters in use by defendant city, while being operated in the customary manner, failed to show the characteristics claimed to be inseparable from the operation of the patented apparatus and method. "Positive head," as used in connection with a filtration plant, means the weight of the water, both within and above the sand bed, and is usually measured from the controller or the under drainage system to the surface of the water to be filtered. "Negative head," used in the same connection, means the force that comes into play when a partial vacuum is created, either within or below the filter bed. Sand of "effective size," as used in connection with a filtration plant, means sand containing 10 per cent. by weight that is finer in grain than the diameter sought to be secured. City of Harrisburg (Pa.) v. Continental Jewell Fltration Co., 217 Fed., 366.

Discretion of State Public Service Commission.—Where the public service commission ordered a waterworks company to terminate a contract by which it had agreed to furnish water to certain mills free for forty-nine years, after a hearing of which the mill companies had no notice, and later the mill companies intervened and showed that the contract was executed in consideration of the transfer by the mills to the water company of the water plant, though there was no reservation of the right to use the water in the deed of transfer, it was not abuse of the commission's discretion to set aside the former order directing the termination of the contract. State ex rel. Raymond Light and Water Co. v. Public Service Commission of Washington et al., 145 Pac., 215.

Damages for Change of Established Grade by City.—Where a city by ordinance has established a street and curb grade for both roadway and sidewalk, both the city and adjoining property owners were bound to conform to such grade, and the city after such conformity could not change the grade without payment of damages resulting to the property owners thereby, but abutting owners could not recover damages for the destruction of their old sidewalks so far as they did not conform to the official grade, but were entitled to recover such damages as resulted solely from lowering the sidewalks contiguous to their property below the established grade. Ludwigs et al. v. City of Walla Walla et al., (Wash.) 145 Pac., 193.

Excessive Water Charges May Not Forfeit Franchise.—A violation by a public service corporation supplying water of Const. art. 14, secs. 1, 2, prohibiting the collection by public service corporations of a rate for water in excess of that fixed

by a city council, does not, ipso facto, work a forfeiture of the works and franchises of the corporation, and it may thereafter collect same charges for supplying water. Hatfield v. Peoples Water Co., (Cal.) 145 Pac., 164.

Liability of Municipality for Overloading Surface Drain Is Limited.—Under St. 1909, c. 269, authorizing a town to construct a drainage system and to maintain subdrains discharging water into any brook, and to deepen, widen, and clear of obstruction any brook, etc., and by sec. 5 made liable for damages therefrom, a town which took and paid for the right to lay and maintain a subdrain thru plaintiff's land to a brook did not thereby make the brook a common drain, and have the right to enter upon private land to clean it of obstructions, and was liable only for causing an overflow of the brook and the flooding of plaintiff's land, and not for damages resulting from an obstruction not caused by the subdrain. Diamond et al. v. Inhabitants of Town of North Attleboro, (Mass.) 107 N. E., 445.

Town Liable for Overflow of Standpipe.—Regarding a town's liability for overflow of its standpipe onto adjacent property, tho the regulation valve, clogging of which occasioned it, was under control of the metropolitan water system, with the conduits of which the town's service pipes were connected, yet it being unquestioned that, if foreign substances in the water passed into the valve, it would cease to work automatically, and leak, flooding the standpipe, and there being evidence that an overflow pipe, which would have prevented the damage, was feasible, the jury could find the town reasonably ought to have anticipated and guarded against the condition. Kelly v. Inhabitants of Town of Winthrop, (Mass.) 107 N. E., 414.

Town Liable for Negligence of Waterworks Employe.—Within the rule that a municipality is liable for negligence in operation of a system of waterworks if it is operated as a commercial venture, it is immaterial that the city may not make a profit, if in its essential nature it was to be operated for a profit, and it could not escape liability for negligence in operation in that it was to get a portion of its supply of water from the metropolitan water system, which was entitled to the immunities of a governmental undertaking. Pearl v. Inhabitants of Town of Revere, (Mass.) 107 N. E., 417.

Water Company Not Required to Supply Beyond Area for Which Intended.—A state commission is without power to order the owner of a water system, constructed and operated only to supply residents on certain lands, to connect such system with other consumers and furnish them with water, where there was no evidence to warrant a finding that the supply of water was more than required to properly serve the consumers for whom it was intended. Van Dyke et al. v. Geary et al., 218 Fed., 111.

Liability for Damages for Grade Crossing Elimination.—Where a municipal corporation changes or regrades its streets, and does so skillfully, without trenching on the property of adjoining owners, it need not pay consequential damages, since abutting owners hold their property subject to the right of the city to make such changes in the grade of the highway as public convenience may require. If it is to eliminate a grade crossing, for convenience of the general public, an abutting owner cannot recover from the city because the change in the grade resulted in the greatest benefit to the railroad company. If the railroad company had nothing to do with the work of changing the grade, it is not liable to an abutting owner, tho it is greatly benefited; but where the city gave its consent to the construction of an approach to a bridge by the railroad company, and the company voluntarily did the work for its own interest, it is liable to an abutting owner in damages, where the approach rendered access to his property by an alleyway more difficult. Baltimore & Ohio Ry. Co. v. Kane et ux.; Mayor and City Council of Baltimore (Md.) v. same, 92 Atl., 532.

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## Sewage Farm for Ontario, Cal.

The city of Ontario, Cal., has purchased 175 acres of land at $225 an acre on which to discharge its sewage for irrigation and fertilization purposes. The city then leases the farm to E. A. Parkford, from whom it is purchased, at $3,150 a year for 25 years with two years rental in advance, the city to deliver its sewage to the farm without cost to him.

# Motor Vehicles

## The Motor Truck in Road Building

MOTOR trucks effect a large saving in the cost and reduction of the time in every road-making operation. County commisioners and road contractors are using such trucks in grading, leveling, dragging, surfacing and rolling roads, as well as in hauling, dumping and spreading road material. Gasoline trucks will do all of this work cheaper than it can be done by any other method.

The wide steel wheels of the trucks shown in the photographs enable them to operate on soft, fresh-made surfaces or in pits where snatch-teams would be needed for horses, hauling five tons of material.

A 5-ton truck can pull two of the heaviest graders 40 miles a day and pulls a 16,000-pound drag, covering a road width of 36 feet, 50 miles a day. It also packs and rolls the surface with its broad steel wheels replacing the road roller. It pulls trailers when conditions are suitable and is used to transport gangs, tools and supplies.

In Nuxebee County, Mississippi, the prevailing cost of gravel hauling in road work has been $1.70 per ton, when the haul did not exceed six miles. On this basis a recent job of hauling 448 tons from gravel cars at Brooksville to a road job six miles distant would have cost the county $762.60, and the work would have been extended over a long period. Instead of using mules, however, the board of supervisors used a good roads truck and the work was done in ten days, with a saving of $527.23. The total earning under the contract price would have been 448.65 tons at $1.70 per ton, or $762.70.

The operating expenses included:

| | |
|---|---|
| 376 gallons of gasoline at 19c..... | $71.44 |
| 36½gallons of oil..... | 13.86 |
| Grease ..... | 2.70 |
| Total for fuel..... | $88.00 |
| Negro labor at $1.50-$1.75..... | 84.67 |
| Driver ..... | 62.50 |
| Total .....$235.17 | |

leaving a gross profit of $527.53.

The wages for the driver are given as $62.50 for 10 days, whereas drivers can be obtained for $75.00 per month. The three road commissioners for this district express their belief that the county can build roads cheaper with these trucks than they can be built by letting contracts.

The commissioners of Cabarrus County, North Carolina, made a test in which 26 miles of road were rebuilt in 43¼ hours. At the conclusion of the test, Superintendent of Roads J. M. Bunage made the statement that the work was done better than by any previous method. Three different kinds of roads were worked in this test—clay, sand-clay and macadam. The commissioners first unloaded 80,000 pounds of cement, and the truck hauled this material one-third of a mile over a muddy road, including a 4 per cent. grade. Then, in eight successive days, the truck pulled graders and drags on a stretch of road 26 miles long. Every part of the road was graded, dragged and rolled. The ditches were cleared and remade by pulling thru the ditches once on each side after the original grading and dragging had been done. In rebuilding 26 miles of road, the truck traveled 202.5 miles. The total cost for fuel and oil was $48.93. Only two men were employed, the driver of the truck and the operator of the road machinery.

A record for high speed and economy was made in dirt road construction in Guilford County, North Carolina, where, among other results, 2½ miles of road were built in seven hours. One of the heaviest types of road graders was used to cut a hard top soil road, but the truck had no difficulty in pulling the grader at the desired speed, turning up earth as required by the superintendent.

Mule power was pitted against motor power for nine days in a test in Putnam County, Florida. Eight mules were placed

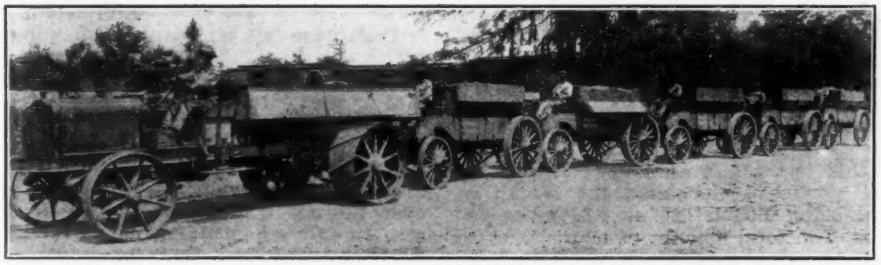
FIVE-TON TRUCK *on road work in Cabarrus County, N. C. Convict labor is used. Note the steep hills to the fill at the bottom to reduce the grades.*

in direct competition with a 5-ton truck, pulling graders and three-way drags over a road which had no hard surfacing, but a large proportion of sand. The result of this test showed that the motor truck, on the same expenditure, did five times as much work in the same time as the eight mules, or, in other words, the truck did the same volume of work at one-fifth the cost of using mules. While eight mules graded and dragged 77½ miles in 90 hours, the truck graded and dragged 161 miles, and, in addition, the smooth, broad wheels of the truck rolled 256 miles. If mules had pulled a 5-ton road roller 256 miles, in addition to grading and dragging as much as the truck, it would have required, as shown by the test, 35¾ days, and the cost would have been $536. The cost of doing this work with the motor truck was $101.90, or $11.77 per day.

In the construction of one test road the entire subgrade was plowed soft. With a full load, the truck was run over the subgrade four times and the broad steel wheels rolled the subgrade smooth. Then the gravel was dumped and spread, beginning at the point nearest to the gravel car. As the loads were hauled to the progressive dumping points, the fully loaded truck, driving over gravel that had already been dumped and spread, packed it down thoroly. Thus the dumping and rolling are done simultaneously. The hauling of the gravel cost 7½ cents a yard mile, the average of 32,067 yard miles.

The highest economy in stone road construction has been achieved by the pike commissioners of Polk County, Tennessee, by taking full advantage of the manifold uses of two 5-ton trucks. Stone of three different sizes for sub-grade and surfacing was hauled, dumped, spread and rolled. The hauling and dumping was done in the quickest possible time by reason of the simplicity and speed of the power dumping mechanism. Rapidity in spreading added greatly to the speed and economy of the work. The first grade was very coarse, the second medium and the third practically dust. The automatic dumping and spreading truck was utilized in this method of sorting, loading and applying the stone. After the road has been properly prepared with a grader, the coarse stone is hauled to the job. The power dumping mechanism elevates the body to an angle of 47 degrees, and the driver pulls a lever which trips the tail-gate at the moment the truck starts to move. In this manner the dumping and spreading are automatic, and the material is applied evenly as to width and thickness. This stone is then rolled by the truck. In exactly the same manner a layer of the medium size stone is spread and rolled, after which a layer of stone dust is applied. When sprinkled and rolled the surface becomes smooth, hard and thoroly bound.

Serious problems in road maintenance have been solved by a similar truck in Orleans County, Louisiana, in a striking manner. A hard shell road, leading out of the city of New Orleans, which had been built through a swamp for three miles at a cost of $90,000, became so full of waves and holes, after seven years' use, that a motor car could not be driven faster than twelve miles an hour with any degree of comfort or safety. It was



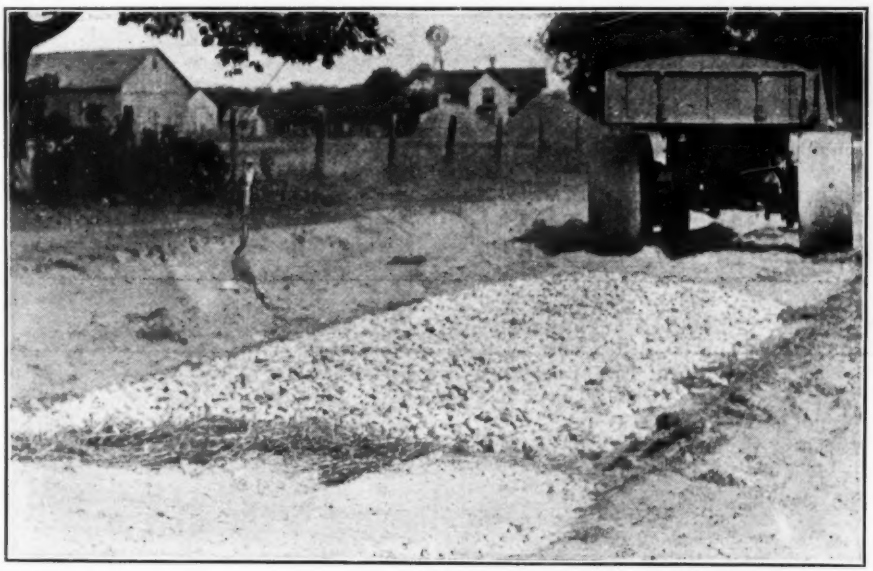
believed that the road would have to be scarified and rebuilt. But, immediately after a soaking rain, a grader was attached to the truck, and, in cutting, the blade of the grader was sunk into the bed of shells, making a furrow four inches deep. After one circuit, cutting and clearing the furrow, the truck made two other trips, moving the loose shells and binding material toward the crown of the road. At the same time the blade of the grader cut off the high spots and filled up the holes. The smooth steel wheels of the truck packed the material thoroly and rolled it smooth. The condition of the binder was such that the material cemented exactly as it was left by the machine. With one day's work the surface of the road was made hard and smooth. Automobiles were driven over it faster than 35 miles an hour with perfect comfort.

When the commissioners of Chatham County, Georgia, used mule teams, it required anywhere from four to six weeks to build one mile of permanent road. With the motor truck and roller-bearing trailers, they build a mile in four days, with a tremendous saving to the county. Fifteen mule teams and a large percentage of the drivers have been eliminated. The Chatham county commissioners conducted a test of 45 days' duration, hauling Augusta gravel, which weighs 2,700 pounds per cubic yard, a distance of 1.15 miles. The truck was tested for 411 hours, and it moved 4,023 tons. This tonnage was handled at the rate of 89.4 tons a day.

FIVE TRAILERS *hauled by a five-ton truck, all loaded, on road work in Chatham County, Georgia.*

| | |
|---|---|
| Total number of tons | 4023.0 |
| Total number of miles | 1662.5 |
| Miles per gallon of gasoline | 1.5 |
| Miles per gallon of oil | 23.0 |
| Total cost of operation | $459.52 |
| Cost per ton | .112 |
| Cost per ton-mile | .10 |
| Cost per yard | .1542 |
| Cost per yard-mile | .134 |

MOTOR TRUCK *has dumped and automatically spread a load of broken stone on a road at Berrien Springs, Mich.*



A motor truck hauled shell at 12½ cents a yard in a test in Volusia County, Florida. The truck did the work of 13 double teams, drivers and wagons, the average cost of which is $5.25 per day for each team, driver and wagon. This represents a gross saving of $68.25 per day. In this test the truck hauled periwinkle shell for road surfacing, the length of haul being 1.08 miles, or 2.16 miles per trip. The total amount of material to be moved was 430 tons, or 573 yards, and the truck hauled 53¾ tons per day, completing the work in eight days. The actual running time, however, was only 28 hours. The time consumed in loading and other losses of time totalled 61 hours. The total cost of operation was $71.80 and the cost per yard mile was found to be 11.6 cents.

## More Gasoline from Petroleum

Dr. Walter F. Rittman, chemical engineer of the U. S. Bureau of Mines, is announced by Secretary Lane, of the Department of the Interior, as the discoverer of a process for producing gasoline in refining petroleum which will increase the gasoline product 200 per cent. or more. The process will be patented and the patent dedicated to public use. The Standard Oil Company has operated such a process for some time and the free use of the new patent will put other oil producers on a par with the Standard in this particular.

## New Motor Fire Apparatus in Boston

According to a recent statement by John Gradey, fire commissioner of Boston, Mass., the department is receiving a large amount of new apparatus. This includes the following:

A new 85-foot aerial truck, motor driven, built by the Seagrave Company, of Columbus, Ohio.

Water tower No. 3, attached to an American and British tractor, which ran over the roads from Providence to Boston.

A Robinson tractor, attached to aerial ladder truck No. 14.

A Robinson tractor for aerial ladder truck No. 15.

Robinson motor pumping engine No. 41 showed its ability to do good work in the worst snow storm of the winter on January 25. On account of second and third alarms from Roxbury, it was moved from House 41 to 33 and again to 13, and while there it responded to an alarm, arriving at the fire promptly and helping to extinguish it. The ease of its operation is reported as materially greater than that of horse-drawn apparatus.

The three water towers in the department are equipped with American and British 2-wheel tractors. They weigh about 9½ tons each and they were run over the roads from Providence to Boston, one of them immediately after a heavy snow storm. They have been successfully tested on steep Parker Hill avenue, covered with snow and ice.

## A Trackless Trolley Car

The accompanying photograph shows a trackless trolley car in operation in Gmuend, Austria, in winter. This method of propulsion of vehicles seems to be fairly successful, and where roads are good but the traffic is not sufficient to warrant street or interurban railway lines, there should be quite a demand for them. The permanent structure being only the overhead wires and the poles supporting them, these lines are much less expensive than cars running on tracks. They are more expensive to construct than automobile lines, but possibly, if electric current is cheap, the operation charges might be enough less to make up the difference.

# ROADS AND PAVEMENTS

## Good Roads Year Book

More than two hundred million dollars of state appropriations have been expended to January 1, 1915, and an approximate total of 31,000 miles of surfaced highways constructed under state supervision since the inauguration of the policy known as "State Aid," according to the Good Roads Year Book for 1915, to be issued in March by the American Highway Association, from its Washington office. Only seven states ,namely, Florida, Georgia, Indiana, Mississippi, South Carolina, Tennessee and Texas, have no form of state highway department whatever, but Georgia grants aid to the counties for road improvement by lending the services of the entire male state convict force. Legislatures now in session are devoting much attention to road legislation and unquestionably several new highway departments will result. North Carolina will probably establish an independent highway department in lieu of the work now done by the state geological survey relating to highways.

New Jersey in 1891 was the pioneer in providing state aid for public highways. Massachusetts and Connecticut adopted the policy shortly after, but only during the past ten years has the state aid policy been in effect on a considerable scale. About 5,000 miles of state highways were completed in 1913 and about 6,000 miles in 1914, so that the past two years have been responsible for more than a third of the entire state highway mileage. The state highways in America now exceed by 6,000 miles the national road system of France.

To have state highway departments placed under non-partisan, efficient control; skilled supervision required in all construction work; a proper classification of highways to insure intelligent distribution of improvements; an adequate provision for maintenance of highways from the day of their completion—these are among the objects for which the American Highway Association is waging a vigorous campaign.

## Municipal Terminals for St. Louis

The franchise of the Terminal Railroad Association of St. Louis for the tracks it occupies on the river front expires next December and the city officials are studying the problem of railroad and water terminals with reference to the establishment of municipally-owned and operated facilities for such terminals and the exchange of traffic between land and water vehicles. Several members of the administration have made a trip down the Mississippi river to study the terminals, especially the municipal docks and belt railway at New Orleans, which furnishes what is in many ways an ideal system of interchange of traffic.

Speakers at the River Terminals Conference, held in St. Louis, September 19, advocated modern cranes and lifting devices for transferring freight from car to boat or the reverse, the most expensive operation involved, that the terminals should be owned by the municipalities and that the fees for their use should be the least necessary to pay maintenance and sinking fund charges.

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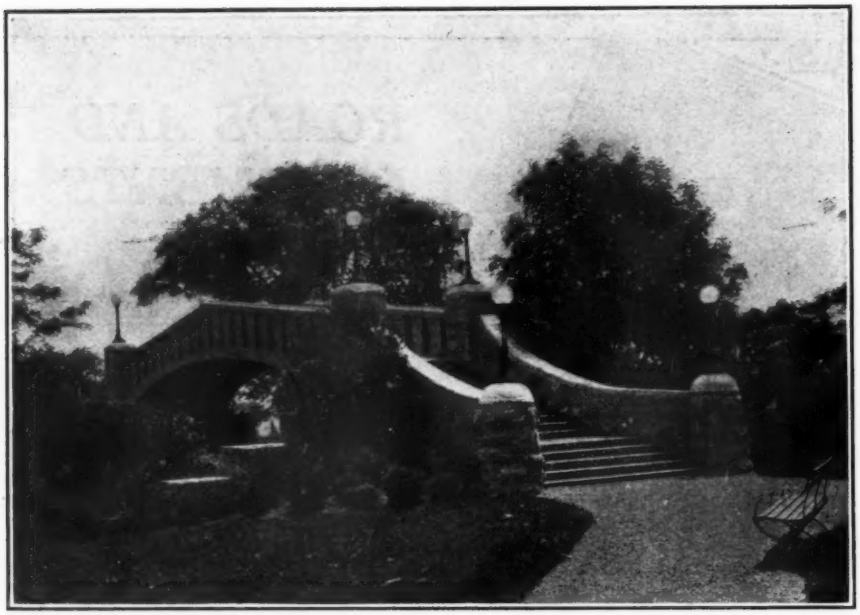
## Grade Crossing Elimination in Dallas

The board of city commissioners of Dallas, Texas, has passed orders taking the first steps toward the elimination of many grade crossings in the city in accordance with the only amendment to the city charter adopted out of thirty-four submitted to the voters in January, 1914.

The city attorney has been instructed to notify the railroads to appear and city engineer J. M. Preston has been asked to prepare a report on the results of his investigations of the subject, utilizing to the fullest extent the new union passenger station. Most of the construction promises to be in the shape of viaducts leading the streets over the railroads, tho the park board is working on a subway under the tracks of the M., K. & T. railroad at one crossing.



## An Ornamental Park Bridge

Attractive features in and about the approaches to our cities serve the useful and commendable purpose of creating on the mind of visitors a pleasing impression of the community.

Too often, however, the districts adjoining the railway depots and boat landings are given over to purely utilitarian purposes, and little or no thought given to their ornamentation. Where conditions will at all permit, there are few features more appropriate at the railway station than an open space with drives and foliage, laid out by the landscape gardener. The visitor on emerging from the train is then greeted by welcome foliage and flowers in the summer, and in winter is permitted to have an unobstructed view of the surroundings.

In open spaces of this kind, an ornamental bridge is an interesting feature, contrasting with the foliage and the water beneath it. The one shown in the accompanying illustration is at Madison, N. J., and crosses two lines of railway, where they pass in a cutting thru the park. The bridge is surrounded by bushes and foliage, and at night is illuminated by electric globes. It is the work of H. G. Tyrrell, bridge engineer, of Chicago and Evanston.

## Finances of Taylor, Tex.

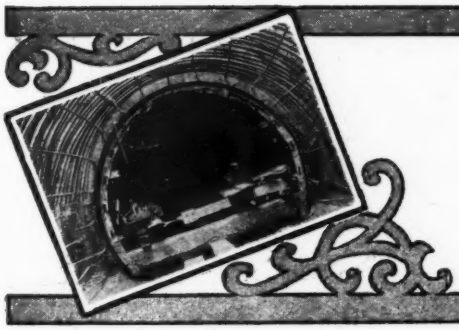
Peter Schramm, city manager of Taylor, Texas, has made a report of the financial result of the operations of the city from May 19, 1914, to February 19, 1915, which is very encouraging. He received from the old city council on the former date, $181.94 in the general fund, and now reports a balance of cash in hand of $3,466.27, after paying $8,278.74 of old bills. The total expenses for the period were $24,275.79, including the old bills referred to.

## Development of Wire-Cut-Lug Brick

In 1910, the Dunn Wire-Cut-Lug Brick Co. started with one licensee making brick under the Dunn patents, 55,825 square yards of pavement were laid, and 2,233,000 brick were sold. This form of brick has so fully demonstrated its value that on January 1, 1915, there were twenty-six licensees operating forty-two plants, and new plants are added at frequent intervals.

The phenomenal growth in the business is shown by the following tabular statement:

| Year | Bricks sold | Yds. of pavement laid |
|---|---|---|
| 1910 | 2,233,000 | 55,825 |
| 1911 | 7,572,250 | 189,306 |
| 1912 | 25,023,904 | 625,597 |
| 1913 | 36,912,320 | 922,808 |
| 1914 | 104,885,745 | 2,622,143 |
| Totals | 176,627,219 | 4,415,679 |



# CONCRETE

## Fire Resistive Value of Concrete

A committee of the American Concrete Institute, composed of Cass Gilbert, architect, New York, past president American Institute of Architects; E. J. Moore, chief engineer, Turner Construction Co., New York; Walter Cook, consulting architect, Board of Estimate and Apportionment, New York; past president American Institute of Architects; James Knox Taylor, formerly supervising architect, U. S. Treasury Department, Washington; Rudolph P. Miller, formerly superintendent of buildings, Boro of Manhattan; William H. Ham, consulting engineer, Boston; Charles L. Norton, consulting engineer, professor of heat measurements, Massachusetts Institute of Technology, Boston; Richard L. Humphrey, consulting engineer, Philadelphia, past president American Concrete Institute; with Mr. Gilbert as chairman, has made a report on the fire of the Edison plant at West Orange, N. J., from which the following is taken:

"The fire fully demonstrated the advantages of monolithic structures. The fact that at five different places several of the wall columns were rendered useless and yet the upper portions of the building stood intact, is evidence of the superior merits of concrete in monolithic construction.

"Considering the extraordinary conditions surrounding this fire, the behavior of the concrete buildings was highly satisfactory and constitutes an excellent demonstration of the merits of concrete as a fire resisting building material. It is not so surprising that the concrete buildings were damaged as that any material should have so satisfactorily withstood these unusual conditions.

"The end walls in the three upper floors of two buildings extended above the roofs of the adjoining buildings, which were completely destroyed; while this was in the hottest part of the fire, the walls were practically undamaged and are an admirable demonstration of the value of concrete walls as a fire barrier.

"The fused metal found in different parts of reinforced concrete buildings would seem to indicate that the fire reached an intensity of 1000 degrees F. in all these buildings, and in many cases as high as 2000 degrees F.

"In the greatest portion of these buildings the concrete remained firm and hard and intact after this severe heat treatment."

Mr. Edison says that 87 per cent. of the reinforced concrete buildings, which were subjected to very intense heat, are in good condition and about 65 per cent. of the machinery they contain can be used with small repairs.

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## Construction of Mile Rock Tunnel, San Francisco

There is under construction in San Francisco, a horseshoe shaped sewer 9 by 11 feet. The sewer is being constructed mostly in tunnel, which is approximately 4,380 feet long on 0.1606 grade per 100 feet. The tunnel extends north from Carrillo street under Sutro Heights to its outfall in the Pacific Ocean.

The excavation work and the concrete lining are being handled from two adits, one of which is at right angles to the tunnel and the other making an angle of 20 degrees with the center line. The distance between adits is 3,116 feet.

The work is being carired on from both ends in three shifts of eight hours each, two shifts being devoted to the excavation work and the third shift being devoted to concreting by the compressed air method. The south heading is in hard blue shale, and the north heading is also in blue shale, but has passed thru blue sandstone.

The drilling in the south head is done by two "Little Jap" hand drills and 25 to 30 pounds of 40 per cent. dynamite is used per round. In the north heading, where the rock has been harder, two piston drills mounted on columns have been used and an average of eighteen 6-foot holes drilled, requiring from 50 to 70 pounds of dynamite per round.

As shown in the accompanying photograph timbering is used which consists

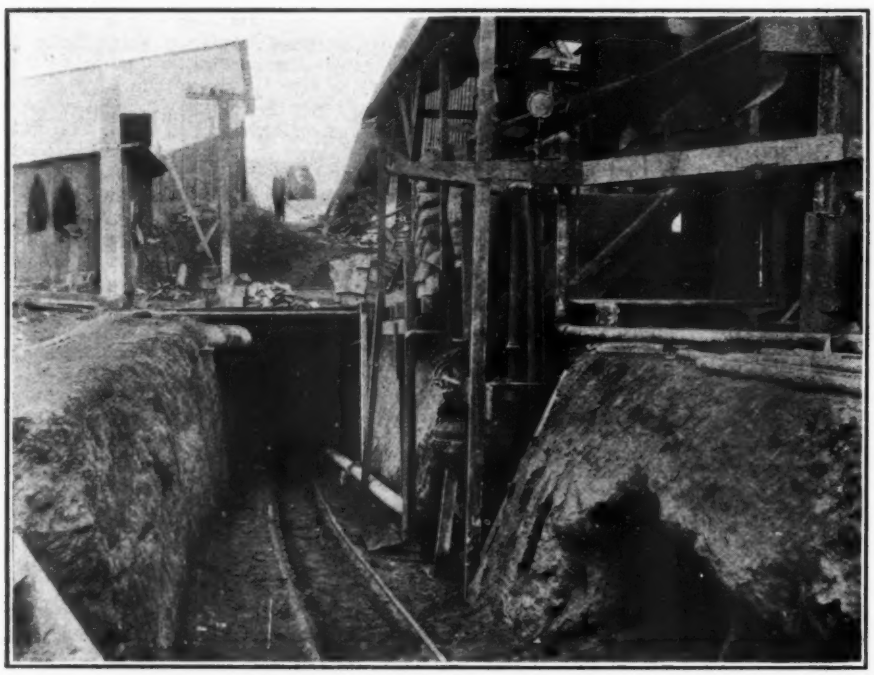
VIEW OF THE INTERIOR *just ahead of the forms showing the concrete pipe as it emerges thru the forms and turns up and back thru the bulk-head, delivering the concrete in place at the crown of the arch.*

CONCRETE MIXER AND CONVEYOR *and loading plant as built at the adit to the tunnel.*

of a two-post five-segment arch of 8 by 8 timbers spaced about five feet centers. Lagging is used only in bad spots.

Mules are used to haul up the muck which is placed in ¾-yard narrow-gage cars and wasted near the mouth of the adits.

The concrete work is following the heading and the compressed air plant used to supply power for the drills is also used for supplying air for mixing, conveying and placing the concrete in the forms. The compressor is an Ingersoll-Rand two-stage machine with a capacity of 1,100 feet of free air per minute with a receiver at the mixing and conveying machine of 120 cubic feet capacity. The mixer and conveyor is placed in a niche at the side of the adit, and receives material by gravity from bins erected over it. The material for each ¼-yard batch is measured in a hopper directly above the machine and is dumped into the machine, together with the proper amount of water for the batch. The machine is then closed at the top by means of a flap door operated by an air cylinder. The machine operator then turns on the air, which enters the machine practically simultaneously above and below the batch and conveys the batch thru the delivery pipe from the machine thru the tunnel into the forms. This pipe passed along the floor of the tunnel thru the forms, where it turns up with a 90-degree bend and back with a 90-degree bend, entering



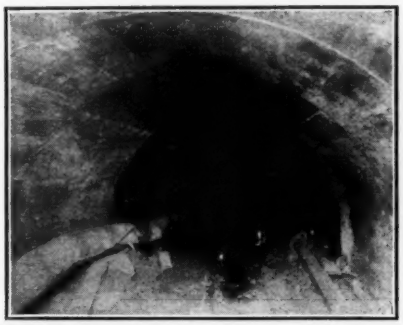
NEARER VIEW OF MIXER *and conveyor. Two men handle all the work at this point.*

the forms at the crown of the arch. A heavy rubber hose about 4 feet long is used on the end of the pipe for distributing concrete. The conveyor pipe is now about 1,300 feet long, but it is intended to extend it to about 2,000 feet. At the present distance about 32 batches of concrete are averaged per hour, but at 600 feet distance the average was about 60 batches per hour.

The finished arch is a very dense concrete, as shown in the accompanying view. The velocity of material projected into the previously placed concrete makes the concrete of great density and also forces the grout against the surface of the forms.

The number of men engaged in the excavation work in each heading consists of one foreman, four miners and six shovelers. The number of men engaged on the concrete work consists of two men on the mixer and two men at the forms. Electric signals are used between the forms and the mixer for regulating the operations. The concrete material is a 1:2¼:5½, when a 2-inch gravel is used.

The contractors for the work are R. C. Storrie & Co., of San Francisco. The Pacific Concrete Placing Company, of San Francisco, are the contractors for the concrete work. Pneumatic machines for mixing and conveying concrete are leased by the Concrete Mixing & Placing Company, Chicago. The work was started in August, 1914, and the construction part will cover about one year.



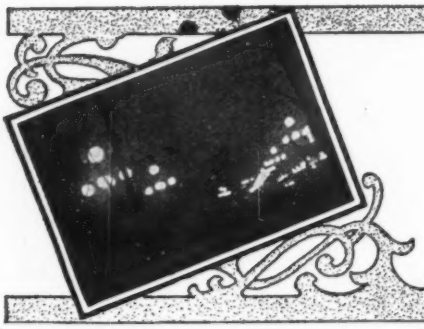
SHOWING COMPLETED LINING *and concrete conveyor pipe at lower right hand and ventilating pipe at the left.*

## Alien Labor Law Sustained

The New York Court of Appeals has upheld the alien labor law of that state, under which the contractors say that aliens cannot be employed on public work and that contracts for such work will probably rule somewhat higher in that state as a consequence.

## Sewage Disposal for Fort Worth

It is estimated by Henry and Gregory, consulting engineers, that complete sewage disposal works for Fort Worth, Texas, including a new main outfall sewer, will cost $782,000. The plant would have a capacity of 12,500,000 gallons a day and would treat the sewage of Fort Worth and Polytechnic and the liquid refuse from the packing houses. Outfall sewer and clarification section of the disposal plant, costing $363,000, could be built first and the rest of the plant later, as desired. Charles Saville, C. E., now of Dallas, Texas, aided in the survey and report, which also covered garbage and refuse collection and disposal and street cleaning.



# WATER

## New Water Supply for Salem, Mass.

After the great fire of June 25, 1914, in Salem, Mass., that city decided to install a high pressure water system and increase the supply by a new reservoir and an auxiliary canal from the Ipswich river. The two projects are to cost about $500,000 and according to Patrick J. Kelley, director of public works, will be completed by January 1, 1916.

At the present time the normal water pressure of Salem is 50 pounds. On June 25, 1914, this fell to 40 pounds and in some instances even lower. Under the new plan the pressure will run from 85 to 90 pounds. This pressure will be obtained by building a new reservoir on Mt. Burnet, which is familiarly known as Folly hill, in the town of Danvers. This hill is four miles from the center of the city. The reservoir on its top will be about 210 feet above sea level, will be of concrete, 400 feet by 150 by 25, and of 10,000,000 gallons capacity.

At Wenham lake will be erected a new pumping station to raise the water from the lake into the new reservoir on Folly hill. In conjunction with the new supply the entire city is to be equipped with iron pipe of larger dimensions than formerly, replacing all the old cement-lined pipe. Already about two-thirds of the city has been equipped.

The estimated cost of the high pressure service is: For reservoir and land damages, $125,000; pumping plant, $75,000; new pipe line, $150,000.

The second proposition regarding the water supply contemplates increasing the amount of water brought into the city by taking excess flowage of the Ipswich river. This involves an expense of $150,000 and as Beverly is interested in the latter project it will bear one-third. In both instances provision has been made for the payment of the costs by bonds maturing in 30 to 40 years.

The present supply and storage basin of both Salem and Beverly is Wenham lake and the present daily average consumption of Salem and Beverly together is about 5,000,000 gallons. The auxiliary supply for Salem and Beverly jointly was authorized by the state legislature in 1913. There is a bill in the legislature now to change the point of intake on the Ipswich river a half mile nearer Wenham lake and save $50,000 in construction. The water will be run thru an open ditch 1½ miles long by gravity to a point 2,300 feet from Wenham lake. Being then 15 feet below the lake level, it will be passed thru a pumphouse, to be installed, and delivered into the lake thru a 2,300-foot concrete culvert. This pump will have a capacity of 2,500,000 gallons a day. Under the state grant the city may pump from December 1 to June 1. The Ipswich river has a watershed of something like 400 square miles and the law insists that it must be allowed to maintain a minimum flow of 20,000,000 gallons a day in pumping season. The excess of normal flowage in fall and spring, however, is large, sometimes in the spring floods the flow being as high as 150,000,000 gallons a day.

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## Hydro-Electric Light and Power for St. Louis, Mo.

The Union Electric Light & Power Co., of St. Louis, Mo., has filed with the Missouri State Public Service Commission a copy of its ninety-nine-year contract to use the electric current generated at the great dam across the Mississippi river at Keokuk, Iowa. This contract is made with the Electric Company of Missouri, with headquarters at Webster Groves, Mo., which in turn buys the current from the Mississippi River Power Co., which operates it.

The price to the Electric Company of Missouri is said to be about 4½ mills per kilowatt-hour for current delivered at Florissant, Mo., 130 miles from Keokuk.

The latter company carries the lines 10 miles to Wellston at the St. Louis city limits, and transforms it to meet the requirements of the city service. The

Union Electric Light & Power Co. agrees to pay $687,500 a year for not to exceed 294,771 kilowatt-hours in any one day. This price per kilowatt-hour computed from these figures is not quite 6½ mills a kilowatt-hour as a minimum. For current used in addition, additional price is paid.

An interesting feature of the contract is the provision for adjustment in five years and at ten-year intervals thereafter, the price to be increased at such times one-half of one per cent. for every cent increase in the price of coal per ton in the St. Louis market, so that the cost of electricity will advance as the cost of coal advances, and the increase in price will not depend upon the cost of producing and delivering the electric current.

## Des Moines, Iowa, Loses Right to Buy Water Plant.

The city of Des Moines, Iowa, has lost its right to purchase the city works plant, according to an opinion handed down in federal court by Judge Van Valkenburgh. He denied an extension of time for the city to determine the legality of the election for the purchase, issuance of bonds and the like.

The city agreed to pay the water company $2,302,522 on December 3, 1914, for its plant. The city wanted the time extended to May 15, 1915. It is estimated that the city has spent $75,000 in its fight to buy the waterworks plant.

## Water Company Offers to Sell to San Francisco

At a regular meeting of the supervisors on February 1 a communication was received from the Spring Valley Water Company offering to sell to the city its properties desired for supplying water to the municipality for the sum of $34,500,000. This offer is the same as that submitted to the advisory water committee and was in response to a resolution of the supervisors soliciting such offer and as required by the provisions of the charter. It is now in order for the supervisors to take further proceedings to submit the question of the purchase to the voters.

## Improvements of Garrett, Ind.

The city of Garrett, Ind., has a population of about 5,000 and is making some notable improvements. In June, 1914, the new city hall was occupied. It is 50 feet wide and 125 feet long, two stories, with a high basement. The building is successfully heated with exhaust steam from the city water and electric light plant, which is 1,700 feet distant. The city had a municipal Christmas tree in the street in front of the city hall with a program prepared by the Garrett Municipal Yuletide Association, with a speech by the mayor, songs and distribution of gifts before and after.

In 1914 the expenditures for city purposes were practically $50,000, and the balance in the treasury was increased about $1,000. The city has $123,000 worth of property, including $34,500 for city hall and lot, $30,000 for water mains, hydrants, etc., $6,000 for steam heat pipe line, $8,500 for electric light plant, poles and lines, $3,500 for ornamental street lights, and many smaller items. The liabilities on this property are $8,000 water bonds, about $21,000 on city hall accounts and a few small items, making a total of $31,137.12.

In 1915 it is proposed to construct a trunk sewer to the city drain at a cost of $8,000; to install a new engine and accessories in the water and light plant, costing $5,500; to spend $500 in rebuilding electric light lines in the eastern part of the city, and to spend $2,000 in decorating and placing some tile and terrazzo floors in the city hall. The sewer cost will be assessed on the property benefited.

The water and light plant did a total business of $23,789.87, as shown by the clerk's collections. The number of electric current consumers increased from 715 to 790 and of water consumers from 815 to 850. The expenditures were $21,186.53, of which $1,061.94 was spent for additions to water lines, so that the profit on operations for the year was $3,789.01, not including $3,757.84 received from taxes, which may represent the city's share of the cost of operating the plant, so that the total gross profit of the plant was $7,546.85. This would pay, say 10 per cent. interest and sinking fund charges on a plant cost of $75,000, which is at least 40 per cent. more than the valuation of all parts of the plant in the schedule of the city's assets. The plant actually paid the city $3,000, besides making the investment of about $1,000 in new construction, and still has a balance in its treasury of $3,209.63 as against an overdraft the year before of $151.55.

The plant may, therefore, be classed among the successful plants and is justified by its balance and the increase in its business in making the proposed enlargements.

## Greatest Drainage Pumps in Operation in Louisiana

On Saturday, February 13, the greatest drainage pumps in the world were started at New Orleans, La., signifying the beginning of a new era in North American conservation and a definite step in the plan of the State of Louisiana to bring into use some 10,000,000 acres of alluvial lands for the purposes of agriculture. They discharge 1,000,000 gallons of water a minute, and in three days' time completely drain an area of 40,000 acres. New Orleans lies on both banks of the Mississippi river. This land is situated on the great peninsula formed by the curvature of the Mississippi, and part of it is the city of New Orleans itself, the remainder being in the parishes of Jefferson and Plaquemine. These are part of the 10,000,000 acres of Louisiana lands which are being reclaimed by the simple process of pumping.

Holland, after seventy-five years of labor and expenditure of $3,200,000, drained 40,000 acres. Construction of the drainage plant opposite New Orleans has been under way for less than a year. The total cost will be $234,000, and it will require only three days to draw off the water and increase the value of land from $100 per acre to a minimum of $300 per acre. Coincidentally, the mosquitoes will perish and human health and comfort will increase.

This work, comparable in its potentiality to the digging of the Panama canal, is the work of one man, George A. Hero, a wealthy citizen of New Orleans, who placed his name and credit behind the task.

Under intelligent laws, framed for such purposes, a drainage district was created and the land-owners voted a tax against themselves of 75 cents an acre a year for forty years. Drainage bonds, backed by the credit of the State of Louisiana, and further backed by the privilege on the land itself, were issued and disposed of at once.

Other intelligent laws were enacted to aid this and other economic projects in Louisiana. Money invested in land mortgages is free from taxation, also is money on hand, in banks or homestead associations. To-day these fundamental laws of Louisiana have prepared the way for great economic changes. One of these is the huge new cotton warehouse system, owned by the public. This is part of the dock and wharf system, which is likewise owned by the public. This great warehouse system will have facilities for accommodating and handling 4,000,000 bales of cotton, or practically one-third of the entire crop of the South.

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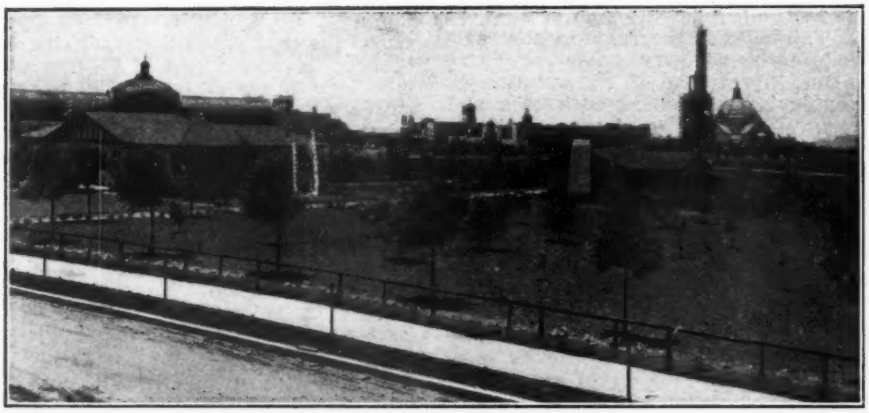
## San Diego Exposition's Model Farm

The accompanying photograph shows a part of the model farm which forms a part of the Panama-California exhibition at San Diego. The five-acre tract contains trees which bear peach and apricot and loquat and walnut and cherry and pear, and beneath the boughs are a thousand rows of vegetables, filling every foot of soil and leaving no space wasted; the whole surface is irrigated and farmed scientifically, and the tract under such treatment is bearing more than an area four or five times as large under old-style treatment. There is a small poultry ranch at the rear, a little vineyard, a berry patch. In the center of the farm is a model bungalow, at which the wife of the prospective farmer may look, and see that, while machinery is saving her husband the drudgery of the farmer's life of three or four decades ago, so machinery is saving her the drudgery which was the lot of that earlier farmer's wife. She will see that in leaving the city apartment she is not abandoning modern comforts.

We are indebted to the Seagrave Company, who furnish the fire protection for the exposition, for the photograph, which is copyrighted by the exposition company.



# SANITATION

## Sewage Disposal at Lethbridge, Alberta

The new sewage treatment plant at Lethbridge, Alberta, is described in a paper before the Canadian Society of Civil Engineers, by A. C. D. Blanchard, who was city engineer at the time the plant was built, on plans of T. Aird Murray, consulting engineer, which were somewhat modified by Mr. Blanchard. The following notes are taken from this paper:

The city of Lethbridge is situated on a level plateau about 250 feet above the Belly river. Its first waterworks system was built in 1904. At the present time the population is about 12,000. With the extension of sanitary sewers the volume of sewage is rapidly increasing. The water pumped averages 1,300,000 gallons per day, and the waste returned to the disposal works is in the vicinity of 1,000,000 gallons per day. The city has a separate sewerage system, and three converging outlets bring all the sewage to the site of the works by gravity.

In the design of the sedimentation tanks there was sufficient novelty to evoke considerable discussion at the meeting of the Dominion Health Commission in Montreal in 1911, and as a consequence, some details of the design were altered, but the general type remained the same. The particular type of tank installed has been known as the "Lethbridge" tank. There is nothing unusual in the design of other parts of the plant, which is intended to treat the sewage of the city by preliminary screening, sedimentation, sprinkling filters and a further passage thru small sedimentation tanks. The liquid thus purified is passed thru a narrow baffle-race where chlorine solution may be applied.

The detritus tanks which contain the screens are in duplicate and have hopper bottoms, each equipped with a sludge valve. The screens do not reach to the bottom of the chambers. They are of ½-inch wrought iron with ½-inch openings. After passing thru the screens, the liquid passes over a weir into a collecting channel, and is then distributed thru two 18-inch pipes controlled by penstocks into the distributing channels of each sedimentation tank. The sludge or detritus in the compartment of the detritus chambers is intended to be disposed of thru sludge pipes discharged by gravity into one of the sludge beds. Each detritus tank, in volume, contains 675 cubic feet. The liquid surface area is 120 square feet and the area of the screen, including openings, is 52 square feet.

The sedimentation tanks are in duplicate. They are covered with a concrete roof 6 inches thick, supported by 24-inch I-beams, excepting over channels, which are covered with removable creosoted planks. Thruout the length of each are two distributing weirs. The one first reached by the liquid is on a slope of about 2 inches in the length of 100 feet, and the second weir is level. This latter weir is intended to equalize the flow so that the velocity of the liquid across any portion of the tank will be uniform, thereby causing the minimum of disturbance during settlement. Before reaching the collecting weir, the sewage is baffled by a 6-inch concrete wall with 4-inch holes near the bottom of it at intervals of 3 feet. The liquid passes thru these apertures into the collecting channel over the weir. This channel averages 15 inches in depth, there being a bottom slope of 6 inches from end to end. The particles capable of settling during the period of flow in the tank are deposited on slopes of wire glass, and when they have accumulated in sufficient mass the solids slide down the slopes and under the glass apron into the sludge compartment. This apron is a distinctive feature of the Lethbridge tank, and consists of ¼-inch wire glass laid on 4-inch I-beams spaced 5 feet on centers. The apron has a slope of 1 foot in 3.3 feet, and completely covers the sludge chamber. The corresponding fore-slope at the collecting side of the tank is formed in concrete on solid foundations, in which the wire glass is imbedded to form a smooth surface. The

slope of this portion is the same as that of the apron. Each tank is one hundred feet long and thirty-two feet wide. The period of flow for maximum capacity is practically two and one-half hours, and the maximum average velocity of flow is at a rate of .037 foot per second. The total contents and measurements of the various compartments are as follows:

(a) Total capacity.....34,000 cu. ft.
(b) Sludge capacity.....10,133 cu. ft.
(c) Capacity above apron..16,475 cu. ft.
(d) Capacity between sludge line and apron ..... 8,000 cu. ft.
(e) Liquid surface area... 3,200 cu. ft.

Note.—Sludge capacity is taken up to toe of fore-slope.

The capacity of the sludge compartments of both tanks amounts to 20,266 cubic feet. Storage is provided for a period of three and one-half months, based on a separation of 3½ cubic yards of liquid sludge to each million gallons of sewage. Each compartment has four hopper-shaped bottoms, a separate sludge valve being provided at the junction of the four slopes in each bottom. Two slopes of each hopper have a pitch of one in three, these variations being caused on account of the fact that the hoppers are not square. The top of the sludge compartment is, of course, formed by the glass apron previously mentioned, and this apron has sufficient pitch to allow gases which collect on the under side to pass to the extreme upper part of the apron, from which they are removed thru small galvanized iron pipes. In addition there are two 9-inch vitrified pipes at the ends of each tank which also serve as outlets. The sludge valves open on a 6-inch cast iron pipe line running lengthwise with each tank, and after these pipes are carried beyond the wall of the tanks they meet a 9-inch pipe line leading from the detritus tank sludge chamber directly to the sludge beds. The stems operating the sludge valve extend thru the glass apron to the roof and are exposed for use by removing small cast iron covers set in the concrete roof. One-inch water services direct from the city force main are connected to the end of each line of sludge pipes for the purpose of flushing, if desired.

The collecting channel between the sedimentation tanks discharges into a cast iron pipe with a bellmouth on a level with the bottom of the channel. The sewage in entering this bellmouth is subjected to a natural vortex motion for the purpose of giving the liquid a chance to draw down and absorb all the oxygen possible. This pipe, which is 21 inches in diameter, discharges into a distributing chamber in which are located the three controlling valves for each of the three filter units. The liquid passes thru to either of the filters by means of 12-inch cast iron pipes laid along the bottom of the filter floors to the riser pipes at the centers of the filters. The filter apparatus is of the standard rotating "Cresset" type. The sprinkling arms cover a circle, having a diameter of 108 feet, and are probably the largest yet installed in this country.

The filters are three in number with concrete floors and have their surfaces exposed to the weather. They are placed in juxtaposition so that the circular walls surrounding them do not meet at the point of contact of each filter. The walls are of concrete, and the filters are built on the natural soil, except at one place, where it was found that the ground was not sufficiently high to carry the floor. At this point the outside walls were carried down to the proper foundation, and the space between the ground level and the under side of the concrete floor was filled with gravel, the maximum fill being in the vicinity of 2 feet. The medium is composed of a mixture of broken brick, hard furnace slag and gravel, the average diameter of the particles being about 2½ to 3 inches. Near the bottom of the filters the slag was put in, in large pieces to protect the 4-inch collecting pipes of vitrified and field tile, which have ¼-inch open joints, and also to permit the quick flow of the liquid along the bottom. The central arm or standard carrying the revolving arms was surrounded by a pigeonholed brick wall, about 4 feet away from the drum. This construction was not only for the purpose of inspecting the machinery, but also to provide ample aeration for the filter beds themselves. The slope of the floor is 6 inches in a distance of 54 feet. The total medium area of all three filters is 0.62 acre, the average depth of medium, 7′ 0″, and the minimum capacity of the sprinklers is one-fifth of maximum, or 133,300 gallons to each distributer.

The humus tanks, for the purpose of obtaining further settling of the partially purified liquid after passing thru the filters, are constructed in duplicate, and are built adjacent to the filters, and at a depth sufficient to provide a good fall from the central collecting channel of each filter to the distributing channels of the tanks. They have each a capacity of 4,120 cubic feet. The bottom slopes of these tanks are drained to one central sludge valve, and in order to clean out one of these tanks it is necessary to decant the liquid and drain off humus from the bottom with the aid of flushing. These tanks are likewise constructed of concrete and are provided with a roof of concrete reinforced with expanded metal and steel beams in the same manner as the sedimentation tanks. The liquid is

drawn off from the tanks into the collecting channel over weirs 12 inches wide, and it then passes into a bafflerace at the upper end of which is inset a pipe leading to the float chamber in the chlorinating house. There is also to be installed a small pipe carrying the hypochlorite solution.

Measurements of each humus tank are as follows:

(a) Capacity .....4,120 cu. ft.
(b) Liquid surface area....1,200 sq. ft.
(c) Length of influent and effluent weirs ..... 80 ft.
(d) Distance apart of influent and effluent weirs. 15 ft.
(e) Difference in elevation of influent and effluent weirs ..... .1 ft.

The design of the chlorinating plant is so arranged that there is an automatic regulation of the flow of chlorine solution into the liquid. This is done by the rise and fall of the float in the float chamber, which operates a lever, which in turn regulates the supply. Thus, if the volume of liquid coming thru the humus tank is increased, the level rises in the bafflerace, causing a consequent increase of chlorine solution to be applied. The baffle-race is only intended to give a thoro mixing of the chlorine solution before the liquid is discharged into the main outfall sewer, which carries the finally purified effluent to the river at a distance of about 1,000 feet.

The sludge beds are in duplicate and are simply rectangular excavations in the soil. It was not found necessary when the plant was constructed to do anything towards putting in a gravel or broken stone bottom to these beds, as there are strata of gravel in the excavation which carried away moisture from the deposited sludge in a most effectual manner. This was taken advantage of in the construction of the sludge beds. A narrow roadway at the end of each bed gives access for carts for removing the dried humus. Each bed has a surface area of 480 square feet.

Operation of the plant was commenced in the month of October, 1912, and the apparatus was given a fair trial before heavy frosts set in. Some difficulty was encountered in obtaining a proper seal in the drums of the rotating filters, and it required a considerable length of time to find out the exact cause of the defect. After careful examination it was found that the upper portion of the drum had developed a very small leak which allowed the air gradually to escape, with an ultimate loss of the seal. This was easily repaired and continuous running of the filter units was then possible.

After a month or two, however, it was noticed that a very considerable amount of colloidal matter was accumulating in the revolving arms of the filters, and it was found necessary to employ a man for a large portion of the day to keep the small holes in the filter arms from choking. After several endeavors to find the cause of this trouble, it was observed that when the accumulation in the detritus tank increased the accumulation in the filter arms became more objectionable. Since no adequate means were provided for removing the detritus from the bottom of the tanks, it was decided to flush the accumulating sludge out into one of the sludge beds. This process was then adopted at regular intervals. It appeared, however, that if the detritus tanks were sufficiently shallow to cause practically all the matter which would not pass thru the screens to go over into the sedimentation tanks and there be deposited as sludge, the liquid reaching the tanks would be more uniform in consistency, and the process of treatment improved. An alteration of the shape of the chambers was then considered, providing for the filling up of the lower portion of the detritus tanks with stone or gravel, and the building in of a concrete floor, the screens being sloped sufficiently to give the proper area for the capacity of the plant. By doing this it was hoped that the difficulty in connection with the clogging of the filter arms would be obviated, and the nuisance caused by the flushing of the fresh sludge into the sludge beds eliminated. The particular design adopted for the detritus chamber was felt to be the most troublesome feature of the plant.

After the plant had been operating for a month or two, severe frosts were experienced, which caused considerable ice to form on the top of the exposed filter beds, and on one occasion, after a snow fall of some 6 or 8 inches, one of the filters was started up with the expectation that the warm sewage would melt the snow. Unfortunately, however, the weather suddenly became colder, and instead of the snow disappearing, it was changed into ice, and it was found impossible to get rid of this accumulation until it was removed entirely from the filters. This was the only time that there was any trouble with the revolving arms on account of the accumulations, and it should never recur, as the operator has had the benefit of past experience. Thruout the winter months ice appeared on the surface of the filter beds during cold weather, and gradually built up into circular ridges between which were narrow openings, these openings, of course, appearing directly in the line of spray from the filter arms. No attempt was made to measure the efficiency of the beds under such conditions,

but it is hoped that a proper laboratory will soon be installed with a chemist in charge, and analyses made of the effluent not only from the filters, but also after passing thru all stages of purification. After running the plant thruout the winter months, it was found possible to obtain continuous operation of the filters with their machinery and surfaces exposed to the weather. In the following summer it was established that the fly nuisance was not a serious factor in so isolated a position. The construction of costly roofs over the filter units was therefore abandoned, altho provision had been made in the design of the filter machinery for the support of roof trusses from the central posts.

The filters are all thrown into use by the opening of penstocks by hand, which would appear to be a better arrangement than automatic control, for the reason that the winter conditions are sufficiently severe to cause freezing in the drums of filters which might be thrown out of commission for any length of time unless these were drained. Every time a filter is shut down, therefore, the operator proceeds to drain out the drum forming the air seal.

The difference in level between the surface of the liquid in the sedimentation tanks and the top of the riser at the center of each filter gave considerable trouble when a large volume of sewage was delivered to the plant. There was a noticeable surge in the distributing chamber at the entrance to the filters, and frequently the top of the riser would overflow, thus discharging unfiltered sewage into the humus tanks. It was deemed advisable to make an overflow from the distributing chamber, and this was accomplished by cutting thru one of the walls of the chamber and inserting a 12-inch pipe delivering into a trough laid on the top of the filter medium between filters Nos. 1 and 2 at a place not reached by the distributing arms. This arrangement seems to give satisfaction, and once or twice each day there is a surge which is efficiently taken care of in this way.

## Garbage Disposal for North Yakima.

The health officer of North Yakima, Wash., Thomas Tetreau, recently made a report on garbage disposal by the sanitary fill system which follows. The city has some 2,000 loads of garbage a month to dispose of and about one-third the quantity of ashes:

The constant burning of garbage at the dump gives rise to many complaints from persons who are seriously inconvenienced by the decidedly unpleasant odors to which this burning gives rise. It has, therefore, been decided to try the "sanitary fill" system. The so-called sanitary fill was first tried in Seattle during 1913, and has been found there to be a most satisfactory and economical method of garbage disposal. Waste products of all kinds, including table refuse and other household waste, such as old clothing, mattresses, shoes, rubbers, bottles, tin cans, etc., are thoroly mixed and deposited in low, damp places, in layers approximately three feet deep; if desirable, these deposits may then be covered by a few inches of gravel, crushed rock, cinders, clinkers, or like coarse material. It is found that in these deposits all organic matter is rapidly oxidized without giving rise to any noxious odors.

Oxidation of tin cans and other metal wastes also takes place, tho considerably more slowly than does the oxidation of organic, particularly vegetable, waste. The oxidation is found to be due in part to the direct action of bacteria upon organic matters, which action is greatly facilitated by the porous nature of the deposit, which permits of the absorption of moisture and the escape of the gases formed during the process of decay.

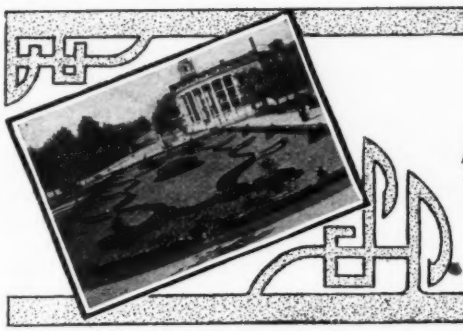
There can be no objection to this method of garbage disposal during the winter months, altho in the summer time it might become necessary to use some insecticide or larvacide, should the dump be found to attract flies.

Your health officer was much impressed with the success of this form of garbage disposal in Seattle, where he recently visited several such fills. Should it be found practical for all seasons in this climate it would probably for a long time do away with the necessity of constructing an incinerator and prove a considerable saving to the city.

## Combined Street Sprinkler and Sweeper

Ed. Smith, street commissioner of Huntington, Ind., has just completed a new sprinkler which will be used in combination with the street sweeper wagon. Formerly a sprinkling wagon and a sweeper wagon were both used on the streets. The new arrangement does away with one wagon, team and man, amounting to $4 a day, besides the amount of water saved, at least one-third of the water generally used.

A large tank, which holds 370 gallons of water, was placed on the sweeper. The tank is made of 20-gage galvanized iron. The sweeper lever is placed on one side of the wagon to allow the sprinkler pipe from the tank to be installed. The pipe is placed just back of the front wheels of the wagon. This gives the water about five feet space ahead of the sweeper.



# Municipal Notes

## Traffic Regulation by Zones Marked on Pavements

The regulation of street traffic has been greatly aided in a number of American cities by the use of marked zones upon the pavements. One detail alone has obstructed the wider and more satisfactory use of the system. Paving brick offers the solution to this perplexing detail.

In both Detroit and Dayton this method of regulating street traffic has proved very successful.

No satisfactory method for marking zones has yet been developed among the police officials who have experimented with the zone idea. They have searched arduously for a white paint durable enough to stand a reasonable amount of street wear when applied to the surface of a pavement. Constant repainting of the pavements at considerable expense has been an accompaniment of traffic zone experiments wherever tried.

The use of anything so impermanent as paint on the surface of a public highway, of course, manifests the experimental nature of the present traffic zone era. When such means of regulating traffic have become standarized and wholly accepted, permanent markings will be needed.

Brick paving offers the best possible medium for such permanent marking. By laying lines of light brick against a dark brick background, or vice versa, lines can be established which will be visible for half a century if left alone, or can be altered at trifling cost to conform with changes in regulations.

The object of the traffic zone system, so far, has been to keep the different currents of street traffic apart, particularly to indicate spaces within which the right and safety of the pedestrian must be respected. Street crossings are outlined with a 10-foot margin back of which vehicles must remain until signalled to proceed by the traffic officer.

Zones are also marked at points in the street where pedestrians enter and leave cars. The lines here inclose a space perhaps 10 by 30 feet in area parallel to the car tracks. Within this space the passenger can wait for the approaching car with a feeling of security that is impossible when the auto driver is not accustomed, by some visible sign, to steer clear of such spaces.

The problem of auto storage in business centers offers another function for marking. Detroit has set aside a portion of a wide downtown plaza as a place for the parking of vehicles. Markings keep the machines in a straight line and indicate how much space each vehicle may use.

St. Louis has made attempts on several streets to establish an exclusive, one-way traffic compensated by a return traffic on a parallel street. This leaves one side of the street for parking vehicles, spaces being marked at right angles to the curb.

In the same city there is attempt to divide auto traffic at street intersections, so that vehicles turning to the right will keep to the curb. while those going forward or to the left will steer near the center line of the street.

The time is probably at hand when travelers at congested crossings will find their way plainly indicated for them by traffic markings. The mosaic effects possible with varying shades of brick offer a method of marking that should be wholly satisfactory.

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## Improvements in Arkansas City

During 1914 the city of Arkansas City, Kan., laid 6,663 linear feet of concrete sidewalk, 4,665 feet of curb, and 2,200 feet of curb and gutter, also 19,537 square yards of paving. A handsome concrete bridge, costing $24,000, across the Arkansas river northwest of the city, is practically completed.

The city now has 23 blocks of asphalt pavement, 8.5 miles of water bound macadam, 6 blocks of brick, 1 block of concrete and 41 miles of sidewalks. The water system has 30 miles of mains and 243 hydrants. Rates are 10 to 25 cents per 1.000 gallons.

## A Profitable Light and Water Plant

The Water, Electric, Gas and Power Commissioners of Austin, Minn., operate a combined electric light and power and water supply plant which seems to be financially successful as shown by the annual statements, which are clear and full as is now required by State Public Service Commissions.

The value of the plant is given by subtracting from the valuation at the end of the preceding year depreciation of 5 per cent. and adding the improvemnets of the year. In the last fiscal year this value increased about $13,000 and is $256,115.25.

Including stock, $14,980 of cash and loan of $4,000 to the city, the total assets are $281,699.34, against which are $30,000 of water works bonds outstanding.

During the year the gross receipts were $69,235.91. Operating expenses amounted to $31,727.66, leaving a comfortable balance after ample allowances are made for interest, taxes and depreciation or sinking fund. The interest and taxes actually paid amounted to $2,138.06.

The business is growing, as shown by a net increase in light users of 201, making 1,408; power users of 3, making 66, and 154 water users, making 1,236. Uncollected accounts amounted to only $95.39.

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## Proper Terms for Highway Bonds

The United States Office of Public Roads has made some studies of the durability of various parts of a highway as a basis of opinion upon the propriety of bonding the state, county or township and upon the terms for which the bonds should be issued. These studies covered 244 roads of gravel, waterbound macadam and bituminous macadam.

For some reason the gravel road is assumed to be 20 feet wide, tho it is more common, especially where gravel is used as the material for the cheaper roads, to make the graveled surface as narrow as the traffic will stand, and the width is usually not greater than 12 feet, and is probably nearer 10 feet. Sometimes the grading is as wide as 20 feet, but even this width is usually not more than 14 to 16 feet. The cost of gravel roads, given as $4,416, is therefore greater than the actual cost, and $2,208 is probably nearer the usual average cost. Probably the proportionate costs of the more or less permanent drainage and grading, 41.15 per cent. of the total cost, and of the quite temporary surfacing, 58.85 per cent., are about the same for the 10-foot width as for the 20-foot width given in the report referred to. The 59 per cent. represented by the gravel can hardly be the basis of a bond issue of more than 5 years' term unless the road is one of very little travel. Probably most of the 41 per cent. for drainage and grading is permanent enough to warrant the issue of 20-year bonds, tho ditches and often bridges and culverts are not built with this degree of permanency, and often not more than 20 per cent. can be considered as having a life of 20 years or more, the remainder averaging perhaps 10 years' life.

The ordinary waterbound macadam is assumed in the report to be 15 feet wide, again somewhat wide except for the modern high-class roads built by state highway commissions. The average cost is given as $9,215, of which 36.89 per cent. covers the cost of the more permanent portions, drainage and grading, and 63.11 per cent. the less permanent surfacing.

For bituminous macadam 15 feet wide the report gives $10,298 as the cost, of which 26.85 per cent. is the proportion expended in grading and drainage and 73.15 per cent. that of the surfacing.

The actual cost of grading and drainage, computed from the above figures, is $3,399 for waterbound macadam and $2,765 for bituminous macadam. As there is no reason for the latter cost being less than the former if the roads are fully constructed, it is probable that this difference arises because the bituminous macadam road is usually a reconstructed macadam or gravel road, on which much of the drainage and grading has been done prior to the construction of the bituminous macadam road. The same seems to be true also of the drainage and grading of the macadam road as compared with the gravel road.

Only a very small percentage of the cost of the kinds of roads above considered can be used as the basis of 50-year bonds; less than 40 per cent., probably as little as 25 per cent., can be used as the basis of 20-year bonds, and the remainder, 60 per cent. or more, could not be used as an ordinary business basis for more than 5-year bonds, and the amount should be divided into equal parts of 1, 2, 3, 4 and 5 year bonds if they are to represent any actual material on the ground.

If the roads are well taken care of and the material worn off is replaced each year as a maintenance charge, there may be some argument for longer term bonds for the portion of the cost representing the wearing surface, but a reconstruction of the surface must be made within 5 to 10 years if the traffic is appreciable, and the portion of the bonds representing the surface should not have life enough to last over the time for reconstruction.

Otherwise the road will not be paid for before it is worn out and the taxpayer will be paying for two roads at the same time covering the same area.

## Advertising Newark

The city of Newark, N. J., has been constructing a system of municipal locks and now has in their vicinity factory sites bordering the best equipped water-rail terminal on the Atlantic coast, according to the attractive circulars of the Department of Docks and Meadows, which show the advantageous location of the docks and the factory sites for direct service to factories and to railroads. Newark is styled the new Atlantic seaport. The department will give full information at its office in the Newark city hall.

## San Francisco's First Municipal Tunnel

The Stockton street tunnel has been completed, accepted and was dedicated to the use of the public by appropriate ceremonies late in December. The cars of the Municipal Railway commenced operating thru the tunnel on December 29.

The project for a tunnel in Stockton street from Bush to Sacramento streets was first broached shortly after the fire, and a franchise was granted in 1907 to a private corporation to construct a street railway thru the hill from Market street to the North Beach waterfront. The project proved too great for private financing and the franchise was abandoned in favor of a municipal undertaking.

A large amount of preliminary work had to be done before a start could be made. The charter was amended in 1910 so that the city could have legal authority to undertake the project, and following the adoption of the amendment an ordinance had to be prepared so that the procedure would be adequate for its successful financing. The method called for an assessment of the entire cost upon an assessment district which would be benefited by the proposed construction. There were no precedents for such work in the state, and an original scheme had to be worked out in its minutest detail. The "Tunnel Procedure Ordinance" was framed and adopted in September, 1911, and the engineering department immediately took up the practical part of the work.

The report of the engineer, showing the assessment district, the plans and specifications, and the amount of individual assessments, was filed April 19, 1912. The estimated cost, including possible damages and incidentals, was $631,879. This amount was assessed against 1,443 parcels of lands extending from the south side of Market street to the bay shore on the north. A year was spent in public hearings and in making minor corrections in the details. An action at law, involving the legality of the proceedings, was commenced and resulted in establishing the validity of all that had thus far been done. Damage claims had been settled amounting to nearly $200,000, and bids for construction were received in April, 1913. Actual construction commenced in the month following.

The Stockton street tunnel, as constructed, has the widest arch span of any long tunnel yet designed. It opens a direct line for street car and vehicular traffic between the downtown district and the Panama-Pacific Exposition grounds, and will greatly aid the rapid development of the North Beach territory.

The following data concerning the tunnel are furnished by the city engineer:

Tunnel extends from Bush street to point 182 feet south of the center line of Stockton street.

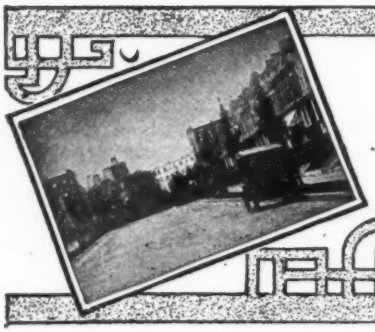
| | |
|---|---|
| Length, portal to portal, feet | 911 |
| Length of north approach, feet | 138 |
| Length of south approach, feet | 275 |
| Total length, including aproaches | 1,324 |
| Height of arch above curb, feet | 18 |
| Width, feet | 50 |
| Thickness of base, feet | 8 |
| Thickness of roof | 2 ft. 8 in. |
| Cubic yards excavation | 143,000 |
| Cubic yards concrete | 16,500 |
| Pounds of steel | 637,000 |
| Price | $430,000.00 |
| Damages | $191,000.00 |

## Connection of Rival Local and Toll Telephones Required

The Railroad Commission of Wisconsin requires physical connection of telephone exchanges so that local and long distance calls on one system can be made on subscribers on the other system. The Rock County and Wisconsin Telephone companies in Janesville were recently required to make such physical connections between their toll lines and between their local systems in Janesville, including rural service, the expense to be paid equally by the two companies.

## Portland Cement in 1914

For the first time since the manufacture of portland cement became a real business proposition in this country there has been a less production in a year than in the year before, the production in 1914 being 88.514,000 barrels, as compared with 92,097,131 barrels in 1913, a reduction of nearly 4 per cent. The production of iron ore in 1914 was about 33 per cent. less than in 1913.



# MISCELLANEOUS

## Bearing Value of Soils

The American Society of Civil Engineers has appointed a special committee to codify the present practice on the bearing value of soils for foundations and to report upon the physical characteristics of soils in their relations to engineering structures. The committee has prepared three sets of questions asking (1) for results of tests for bearing value of soils, (2) for data as to the bearing value of soils from existing structures, and (3) for local practice as to the bearing value of soils. Answers to any or all of these series of questions are requested from every one having information concerning them. The lists of questions will be sent to any one willing to answer any of them, by Robert A. Cummings, chairman of the committee, 221 Fourth avenue, Pittsburg, Pa.

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## Criticism of Engineers

The Western Society of Engineers, of Chicago, has been aroused by the unfair discussion of the report on water power development of the sanitary district made by L. E. Cooley, John Ericson, L. K. Sherman and Wm. Artingstall, and the personal abuse of these men in connection therewith by some members of the sanitary district board and of the city council and by the daily papers, and expresses its opinions in a series of resolutions, from which the following sentences are taken:

While the constitution of the Western Society of Engineers provides that the society "shall neither indorse nor recommend any individual or any scientific or engineering production," it does provide that the opinion of the society may be expressed on "such subjects as affect the public welfare," and it is the desire of the society, by this resolution, to point out that the public welfare is vitally affected by any pronounced attempt on the part of public officials to suppress, conceal, distort or overawe the carefully prepared opinions of experienced engineers reporting on public questions for the public interest.

This society views with regret this public attempt to abuse men who were apparently trying to do their duty to the public in setting forth facts as they found them and testifying to the truth as they saw it, and the society would point out, for the benefit of the public officials who have been conspicuous in this controversy, the following proper relations with engineering advisers, which it wishes to emphasize at this time, as a matter which vitally affects the public welfare:

First—That an engineer's first duty to his client is to tell him the truth, no matter where it may lead or how unpalatable it may be.

Second—That engineering and engineering economics are subject to natural law, which cannot be altered to suit the whims of human nature.

Third—that the most serious disgrace that comes to an engineer is to conceal, pervert or distort natural and economic law, either to please a client or temporarily advance his own interests, and so ultimately lead his client into difficulties.

Fourth—That an experienced engineer of standing ranks as a confidential professional adviser, feeling keenly his responsibilities, and whose integrity and conscientiousness, when properly established, should be appreciated and upheld by his client.

Fifth—That engineers, while not infallible or superhuman, are more apt than laymen to be right in their findings on engineering facts and economic truth connected with engineering matters.

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## International Engineering Congress

The technical success of the International Engineering Congress is now well assured. Notwithstanding the difficulties arising as a result of the present European war, the committee on papers is able to count on from 200 to 250 papers and reports covering all phases of engineering work and contributed by authors representing some eighteen different

countries. The congress will therefore be truly international in scope and character, altho the representation from the countries involved in the European war will naturally be less than originally planned.

The papers are now rapidly coming in and their character gives the fullest assurance that the proceedings will form a most important collection of engineering data and a broad and detailed review of the progress of engineering art during the past decade.

Membership in the congress with the privilege of purchasing any or all of the volumes of the proceedings, is open to all interested in engineering work. W. A. Cattell, secretary, 417 Foxcroft Building, San Francisco, Calif.

## Technical Associations

The Illinois section of the American Water Works Association, until this year the Illinois Water Supply Association, holds its seventh annual meeting at the University of Illinois, March 9 to 11. A very full program has been arranged, covering construction and operation problems, filtration, artesian well water, regulation by public utility commissions and by-laws, accounting, waste prevention, etc.

The twenty-ninth convention of the National Brick Manufacturers' Association was held in Detroit, February 15 to 20. In connection with it the board of directors of the National Paving Brick Manufacturers' Association held a meeting and admitted three new members: the Harris Brick Co., Cincinnati, O.; Southern Fire Brick and Clay Co., Montezuma, Ind., and Standard Brick Co., Crawfordsville, Ind. The board spent "A Night of Good Roads" with "The Knights of Good Roads" at the Hotel Statler, on Tuesday, February 16 with a banquet, an illustrated lecture on "The Importance of Minor Details in the Construction of Brick Paved Highways," by Prof. F. N. Menefee, of the University of Michigan, and booster speeches on "Good Roads and How to Get Them," by Jesse Taylor, of *Better Roads*, and on "A Real Road for Real Estate," meaning the brick roads of Cuyahoga county, Ohio, by Stanley McMichael, secretary of the Real Estate Board of Cleveland.

The proceedings of the Federation of Trade Press Associations at its convention in Chicago, September 24 to 26, fill a book of 194 pages.

The American Proportional Representation League publishes a quarterly, *Proportional Representation Review*, at 5 cents a copy or 20 cents a year. C. G. Hoag, secretary, Haverford, Pa.

The twenty-fourth annual report of the New York Tax Reform Association, for 1914, has been issued by A. C. Pleydell, secretary, 29 Broadway, New York.

The Inventors' League of the United States, founded in 1912, has offices at 124 Maiden Lane, New York City. Charles A. Mullen is one of the vice presidents and Herman D. Sears is corresponding secretary.

An exposition of goods "Made in the U. S. A." will be held at the Grand Central Palace, New York, March 6 to 13.

At its meeting on February 11 the Brooklyn Engineers' Club heard a paper by Eric T. King on the 66-inch steel conduits for the Catskill water supply in Brooklyn.

The National Municipal League offers two prizes of $30 and $20 for the first and second best papers by high school pupils on fire prevention. Clinton Rogers Woodruff, North American Building, Philadelphia, Pa., secretary.

At its meeting on February 9 the Cleveland Engineering Society heard a paper by Prof. C. F. Hirshfield, of Detroit, on the Connors Creek plant of the Edison Illuminating Co.

The County Surveyors' Association of California has been organized, with Drury Butler, of Sacramento, as secretary.

The eighth Chicago Cement Show compared favorably with its predecessors. The expansion of and the great changes in the cement industry can be seen by comparing this exhibit with the first one held. As usual, several associations held conventions during the show, including the American Concrete Institute, the American Concrete Pipe Association, the National Builders' Supply Association, and the Illinois Lumber and Builders' Supply Dealers' Association.

The annual meeting of the American Road Builders' Association is not held at the annual convention, but at a later meeting, held this year on February 6, at the Hotel Astor, in New York. Geo. W. Tillson was elected president.

The annual meeting of the Minnesota Surveyors' and Engineers' Society was held in St. Paul, Minn., February 19 and 20. The program was quite well arranged, sessions being devoted to notes, records and costs; drainage problems; roads and bridges; sanitation, light and heat, with single papers on stadia surveying, explosives, and the League of Minnesota Municipalities. Geo. H. Herrold, secretary, City Hall, St. Paul, Minn.

The fire alarm system of New York City was described for the New York Electrical Society at its meeting, February 17, by Putnam A. Bates, electrical engineer of the department.

The eighth annual meeting of the Indiana Sanitary and Water Supply Association, held in Indianapolis, February 23 and 24, was one of the most successful

of its life. It had a full supply of papers and they were very valuable and gave rise to interesting discussions. Water waste, fire prevention, state control and some problems thereof, water works management, water rates and economies, devices and machinery, sanitary surveys, lawn care and water for it, typhoid fever, industrial wastes, stream pollution, sewage and water purification, destruction of algae in surface water, were well handled. Dr. J. N. Hurty, secretary of the State Board of Health, was elected president.

## Civil Service Examinations

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

April 6: Expert landscape architectural designer in office of Public Buildings and Grounds, Washington, D. C., at $200 a month.

April 7: Sub-inspector in Navy Yard, Washington, D. C., at $4.48 a day, and probably other positions at $3.60 to $5.04 a day; Assistant inspector of engineering material in office of Inspector of Engineering Material at Pittsburg, Pa., at $4.48 a day; landscape architectural draftsman in Engineer Department at Large, War Department, Washington, D. C., at $90 a month.

April 7-8: Electrical draftsman, radio, in Navy Yard, New York, N. Y., and elsewhere, at $3.52 to $5.52 a day.

## Technical Schools

On February 12 George C. Warren delivered a lecture before the graduate students in highway engineering at Columbia University, on "Public Recognition of Patents and Specifications for Patented Pavements," which is issued in pamphlet form for general distribution.

Engineering Bulletin No. 4 of the University of Kansas, Lawrence, Kans., contains a statement of the organization and work of the engineering experiment station of the university, and a study of vocational education in the state, with the courses of study offered in the University School of Engineering.

The report of President Jacob Gould Sherman, of Cornell University, and the other officers of the organization, for 1913-14, has been issued.

A short course in highway engineering was held at the University of Michigan, February 15 to 20, by the Department of Engineering, in co-operation with the Michigan State Highway Department. Lectures by professors from Michigan, Georgia, Illinois, representatives of the State Highway Departments of Michigan and Iowa, Wayne county, and the U. S. Office of Public Roads, consulting engineers on road work, and others, covered the subjects of the split-log drag, continuous maintenance, earth roads, contract and day labor, specifications and contracts, bituminous materials, road service, road machinery, highway bridges, organization, duties of officials, county road plans, etc. Mornings were devoted to "class room work" on earth roads, stone and gravel roads, miscellaneous roads, surveys, plans and record drawings.

The extension division of the University of Wisconsin offers a series of ten lectures to Wisconsin motorists on the automobile, covering types of machines, gasoline engine, fuels and carburetors, battery ignition, magneto ignition, lubrication and cooling, self- starters, transmission, motor car troubles, driving, selecting a car.

## Personal Notes

A. C. Comey, landscape architect, of Cambridge, has been retained by the city of Lawrence, Mass., to make a survey of the district along the Spicket river, to beautify and better the place.

John Nolen, of Cambridge, is at work on plans to beautify the campus and surroundings of Davidson College, at Davidson, N. C.

Edward M. Hagar has resigned his position as president of the Universal Portland Cement Co., one of the subsidiaries of the United States Steel Corporation, to develop a new company to acquire a chain of portland cement plants covering a large part of the United States.

C. D. Martin is the new city engineer of Merced, Cal.

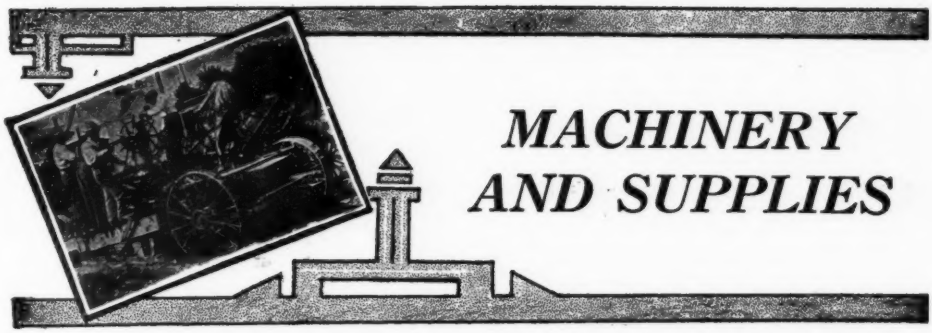
F. L. A. Gorlinski is city engineer of Willits, Cal.

Prof. Arthur H. Blanchard, M. Am. Soc. C. E., in charge of the graduate course in highway engineering at Columbia University, delivered addresses, February 9 and 11, before the Middletown Scientific Association and at the annual meeting of the Engineers' Society of Northeastern Pennsylvania.

Hering & Gregory, consulting engineers, of New York City, have been retained by the Board of Contract and Supply of Albany, N. Y., to prepare plans and specifications for an electrically operated sewage pumping station, to be built in connection with the sewage disposal works; capacity, 30,000,000 gallons daily.

Robert V. Orbison has succeeded the late Lewis E. Smith as city engineer of Pasadena, Cal.

A. G. Wulf, C. E., has opened an office at 309 Provident Bank Building, Cincinnati, O., for the practice of civil engineering, making a specialty of sewerage and other municipal work.



# MACHINERY AND SUPPLIES

## Asphaltic Concrete on Riverside Drive, New York City

The Board of Estimate and Apportionment has unanimously approved the award of a contract for paving the northern section of Riverside drive, New York, with Bermudez asphaltic concrete. The bid for this construction was somewhat higher than the bid on oil asphalt. When the question originally came before the board some months ago Mayor Mitchel said that in the case of a pavement so important as that on Riverside drive the city was justified in giving a preference to and paying a higher price for a pavement that had proved that it would stand the traffic. The drive is now paved with Bermudez asphaltic concrete from 72d to 114th streets, laid by the Barber Asphalt Paving Company in 1913. The contract just awarded will complete the drive to the viaduct at 130th street, beyond Grant's tomb.

## Solid Tire Care

Much is said about the care necessary to obtain good service from pneumatic tires, but there isn't much said about the care of solid tires. and as the truck industry develops this beçomes a more and more important subject.

In fact one hears rather how truck tires don't need any watching. That probably acocunts for a good deal of the tire trouble truck owners experience. It is true that, compared to pneumatic tires, solids need little care, but what care they do need is absolutely essential to full mileage.

By far the most important precaution is to see that the tires are not overloaded. And here is the reason. Everybody realizes that rubber, if stretched too far, will break. Very few people realize that rubber if compressed too tightly will break also. That is just what happens when too great a load is imposed on a truck tire. The tire is crushed between two unyielding surfaces, the road and the steel base of the tire. If the load is too great, the compression becomes too much and the molecular structure of the rubber is broken down.

Another point in connection with this matter of overloading that isn't generally understood is that one overloading will ruin a tire for good. Take a toy rubber balloon. Blow it up. It stretches and stretches, but at a certain point it breaks. And after that the baloon is no good. It can't be blown up again. The same is true with a truck tire, only in a different way. Put a solid tire on a truck and load the truck. The tire compresses and compresses up to a certain point and then breaks. Once it is broken it can't be used again with satisfactory results.

The best tire advice that we can give a truck owner, then, is, "Equip your trucks with tires adequate to carry the load you want to put on them, then give your driver hard and fast instructions that to that point he shall load the truck and no farther.

## The Socket Joint Type of Fiber Conduit

In planning an underground conduit system, one of the most important points to be considered in selecting the material to be used is that which relates to the method of connecting one length of conduit to the next. The importance of this point lies in the fact that upon the method used depends the alinement of the completed system; the degree to which it may be made proof against water and gases and also the degree to which it will protect the cables from abrasions and cuts when drawn across the points. In addition, the methods of making the points increases or decreases the cost of installing the conduit, depending, of course, on the type of conduit material used.

The method pursued in joining clay conduit, unit to unit, is either to butt the ends of the conduit together, wrap the point with burlap and bind with cement mortar; or, connect the units by means of

dowel pins, then wrap with burlap and bind with cement mortar. These methods are the best that can be employed where a clay conduit is used, but from a mechanical standpoint they do not lend sufficient strength to the conduit structure, and any settling of the ground around the system will throw it out of alinement and will in all probability lock the cables firmly within the ducts, or will prevent the drawing-in of cables.

In the socket joint type of Orangeburg fibre conduit the male and female joints that are automatically turned on this type of conduit are so accurately cut that it is only necessary to push one within the other to secure absolute and permanent alinement and without the use of a coupling compound, form a practically water-tight and gas-proof connection. It is not necessary to use a mandrel to secure alinement, neither is it necessary to wrap each joint with burlap to keep the contract from seeping thru the joints to the interior of the duct.

While laying a system of Orangeburg fibre conduit, employing the socket joint type, construction forces have found that the installation of the material proceeds usually at twice the speed required to lay other types of conduit and oftentimes fibre conduct is laid even faster. For figures relative to handling, cartage, and laying of fibre conduit, see pages 34 to 40, inclusive.

## Inspecting Fire Hazards

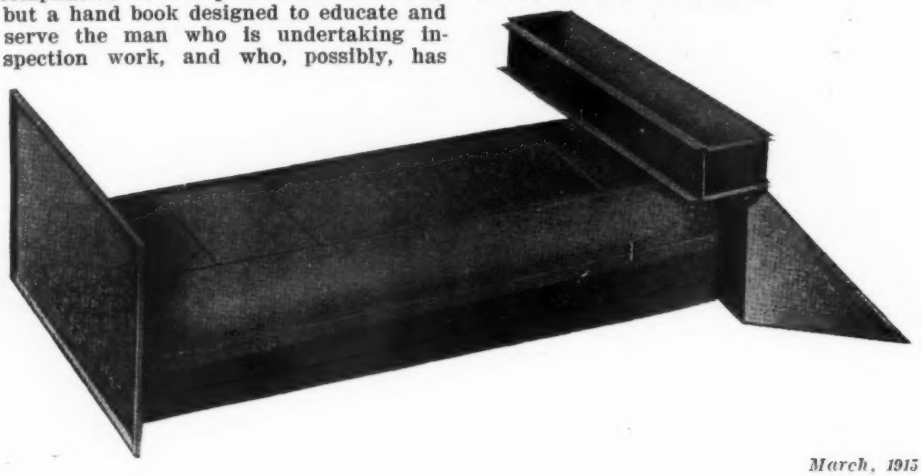
The committee on field practice of the National Fire Protection Asociation has completed its two years' work in the compilation of an inspection manual. This publication is called Field Practice, to distinguish it from an ordinary fire protection hand book, from which it differs radically in function. It is not a mere compilation of fire protection standards, but a hand book designed to educate and serve the man who is undertaking inspection work, and who, possibly, has had very little previous experience. The increasing inspection of premises by uniformed members of the fire departments and by newly constituted municipal inspection bureaus has made such a hand book imperative, covering not only standard equipments, but covering what may be called points of relaxation from the standard which the inexperienced inspector does not know how to look for. This book is designed to point out the common faults in equipment and those points of deterioration difficult for inexperienced persons to discover, with methods and suggestions for their remedy. It is, in its potential usefulness, the most important publication which the National Fire Protection Association has ever compiled.

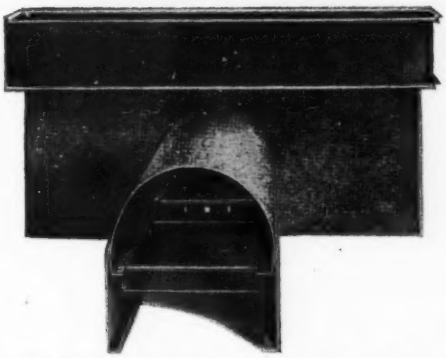
The association has published a list of its pamphlets, standards, bulletins, fire reports, etc., which will be sent on application to the secretary, 87 Milk street, Boston, Mass.

## A Collapsible Culvert Form

A concrete form which is made in one size but will build culverts of spans varying from 15 inches to 5 or 6 feet with either arch, semi-arch or flat top, has been devised by E. J. Whalen, of Syracuse, N. Y., and is in very general use. It complies with the New York state standard plans and with many others.

WHALEN CULVERT FORMS, *set for flat top with quarter circle sections of arch at each side-wall. Note sections of arch form, of cover, and of side-wall plates. One end is supplied with form for end protection wall. The right end is supplied with forms for wing walls and parapet wall. All concrete is cast together into a monolithic structure.*





END VIEW *of form set for semi-circular culvert with end protection and parapet walls. Note method of collapsing form after concrete is set.*

The Whalen form consists of four sections with arch tops and is 24 inches wide, 27 inches high and 24 feet long. The form is equipped with two head walls, each 48 by 84 inches, one set of wing walls, one parapet box and six cover plates, each 2 by 3 feet. The arch top has a radius of about 12 inches.

To build culverts with spans greater than 24 inches, the quarter circles are set with cover plates joining them, thus giving arch forms at the quarters connected by the necessary length of flat top.

The larger of the accompanying photographs shows the method of assembling the parts of the form for this plan of construction. It also shows the placing of the wing walls and parapet box, making a complete protected culvert and parapet in one operation.

By making a complete 24-inch arch, a culvert of double the capacity of a 12-inch pipe can be made in which the amount of water filling the 12-inch pipe would flow only 4½ inches deep, and there would be 7½ inches of culvert height to take care of flood conditions.

The smaller photograph shows an end view of the form set to build a culvert with a semicircular arch top and vertical side walls. It gives a view also of the bracing which makes the form collapsible, so that when the concrete has set the form is certain to collapse when the or knock down the form without assistance. The metal in all the parts of the is very durable. E. J. Whalen is the inproper turns are made and it is then readily removable. One man can set up ventor, the Concrete Form Company are the manufacturers, and the Whalen Form, form is galvanized inside and out and Syracuse, N. Y., is the address which will bring full particulars to any inquirer.

## A Fire Alarm System

A fire alarm system, designed expressly to meet the requirements of the Bureau of Fire Prevention and Public Safety of Chicago, has been developed by the American Telephone Fire Alarm Company, of that city, which has some points of great interest.

The fire alarm boxes are of the break-glass type, simple, non-interfering and positive in operation with a chained hammer with which to break the glass when alarm must be sent in. Each box transmits its own signal according to the code and when once started manipulation of the starting lever will not interfere with the transmission of the entire code of signals. After the code of signals has been transmitted a semaphore falls from its normal position and can not be restored until the box has been reset, rewould and the glass replaced. This semaphore indicates whether the box is in working order.

Any number of bells can be put in the circuit with the boxes and they will all indicate the location of the box operated, according to the signal code.

A control panel and batteries are located conveniently for the employe having charge of the system. This panel contains the testing devices and terminals for connection to the bells, boxes and battery. The circuit control consists of an energized electro-magnetic device, which keeps the circuit under constant test thru a 2½-milli-ampere discharge. When a fire-alarm box is operated, the circuit control is de-energized, allowing its armature, which is equipped with pure platinum contacts, to connect the main fire-alarm battery to the circuit. The code wheel of the fire-alarm box

FIRE ALARM BOX, *as installed ready for use, with glass plate front and hammer for breaking it to send in an alarm.*

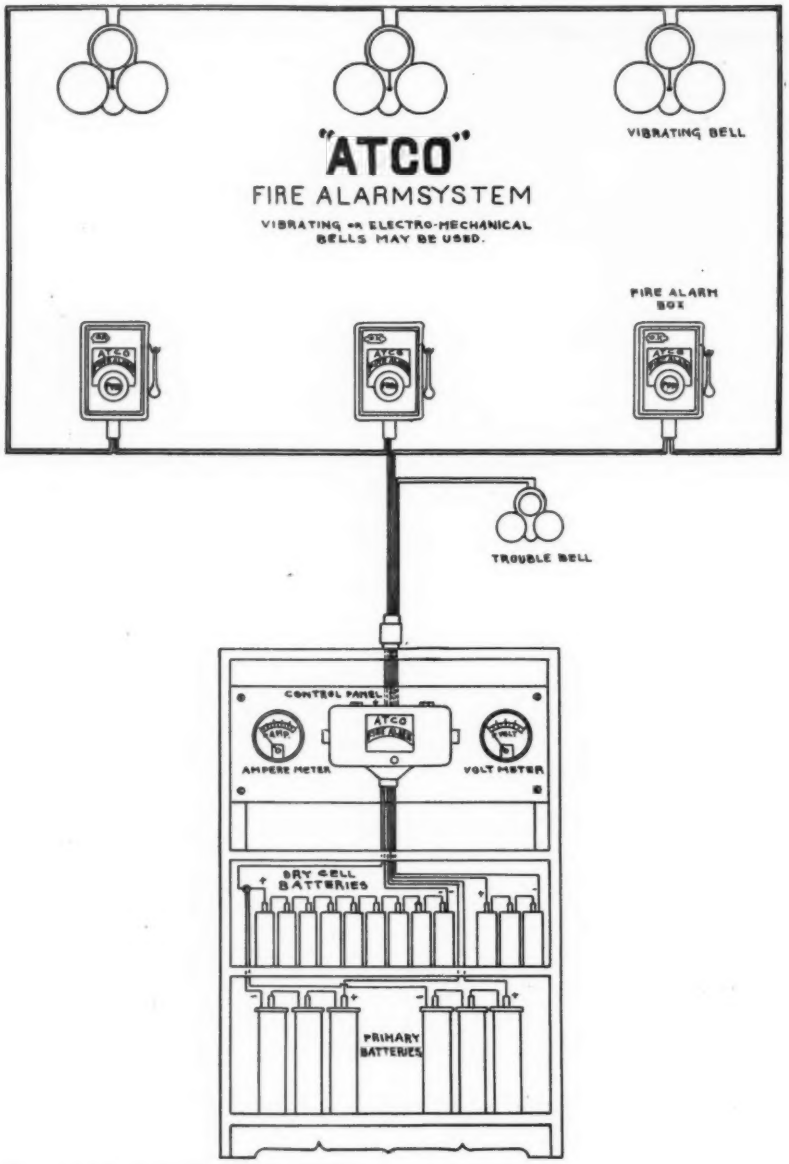



DIAGRAM OF CIRCUITS *and connections for system of American Telephone Fire Alarm Company and of the control panel for the same.*

closes and opens a circuit, causing the bells to strike as the mechanism of the fire-alarm box opens and closes the circuit with its code wheel.

All circuits are connected with the control panel and are so arranged that a break anywhere in the system, whether accidental or malicious, a drop in voltage, or a complete failure of battery will cause the instant operation of a trouble-alarm bell, which continues until the trouble is remedied. This keeps the circuits under constant test, a most valuable feature in a fire-alarm system.

The control panel also has a test lever which, when opened, causes one stroke on all the bells in all the circuits and a constant ring on the trouble bell. This gives a manual test of the whole system at will. A reset is provided in the controller cabinet which electrically resets the circuit controller.

THERMOPILE *for sending in a fire alarm automatically when the heat increasing rapidly indicates starting of a fire.*

A whole building or group of buildings is thus provided with a fire-alarm system, with as many boxes as may be necessary to enable prompt sending of fire alarms and as many bells as may be desired to give notice of the location of the box pulled. The constant test and the daily test are the important features of the system. The name for the plant is the Atco system, and it is made by the American Telephone Fire Alarm Company, 10 South LaSalle street, Chicago, Ill.

The company has combined the Denio system, operating over a telephone circuit as described above, with the Reichel automatic fire alarm, which simply adds a series of thermopiles, which are made of dissimilar metals, thru which a current of electricity passes. This current is generated by the application of heat to the exposed ends of the couples of dissimilar metals, the ends enclosed in the porcelain holders remaining at normal temperature. This current operates a galvanometer, which moves under it into a contact which operates the fire-alarm box.

Ordinary slow changes of temperature do not make sufficient difference in temperature to produce the current necessary to move the galvanometer needle into contact. Sudden heating of the exposed ends of the thermopile, such as would be done by a fire, producing a difference of temperature of some 10 degrees within 60 seconds, between the exposed and enclosed ends of the thermopile causes current enough to operate the galvanometer needle and set off the fire-alarm box. The action depends not on actual temperatures but upon the rate of change of temperature, so that the thermopile will act at any actual temperature provided the rate of change is as above stated, and may set off the alarm in less than the 60 seconds.

## A Speed Lathe Valuable for Municipal Repair Shops

Particular attention is called to the new book just issued by Leiman Bros., 62 John street, New York, illustrating and describing their bench speed lathe.

This machine should be found in every tool room, jewelry and novelty shop or any sort of an experimental or machine shop, laboratory, training school, or home workshop. The machine is very accurately made, having dust-proof bearings and hollow spindle.

Special attention is also called to the low price at which the machine is sold, making it possible for those who have use for a fine lathe to secure one without paying the exorbitant price ordinarily demanded for a tool of this kind.

The machine is especially adapted for turning rods and tubing, for reaming, burnishing and spinning, as well as for drilling, trimming, grinding, frazing and buffing work. The machine is supplied in many different combinations. It is supplied mounted on a bench connected with an electric motor, and having the various fittings used in the above mentioned operations. This machine is very substantially built, heavier, in fact, than would appear necessary, all of which adds to the value of the machine and makes it one that will last practically a lifetime. The machine is made in two sizes, one having a 2-foot bed and the other a 3-foot bed. The swing, however, on each machine is the same, 8 inches, but the distance between the centers is 8 and 20 inches, respectively.

The tailstock is fitted with a self-discharging center and the headstock with a three-step cone pulley. The lathes, however, may be fitted with loose and tight pulleys for operating from a main shaft or a single pulley for operating with a motor.

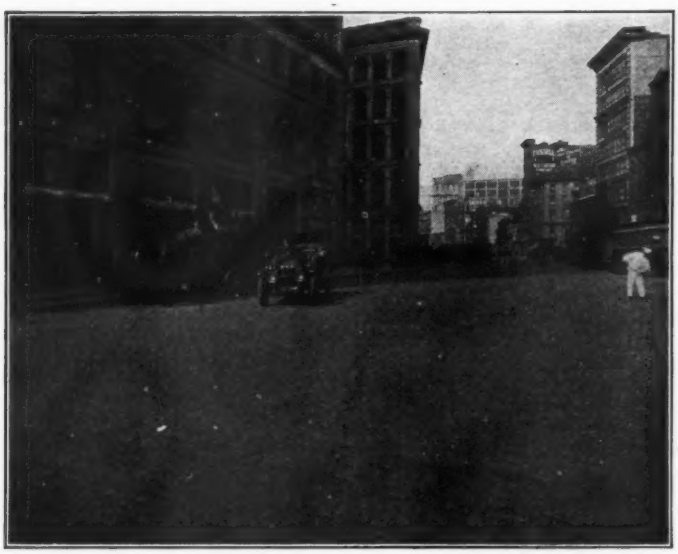
The catalog referred to is especially interesting to those having use for a machine of this kind, and as the price of the machine is much below that ordinarily demanded for a very accurate lathe, it would be to the interest of those interested to secure a copy of the same.

## An Extreme Service Test of Improved Granite Block Pavement

Thru the courtesy of the photographer who made the original picture and the Granite Paving Block Manufacturers' Association, we present herewith two views of Astor place, New York, in front of John Wanamaker's store.

The illustration No. 1 shows the improved granite block pavement as it appeared when completed in 1911. The illustration marked No. 2 is a photograph of this pavement taken on January 13, 1915, from practically the same point as photograph No. 1.

This pavement is actually in just as good condition today as the day when it was laid and close examination of the



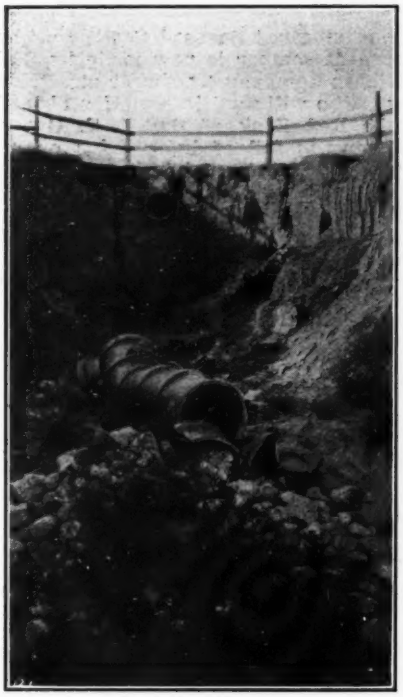
ASTOR PLACE, *New York, improved granite block pavement as completed in 1911, showing condition at that time.*

blocks shows no perceptible wear even under the tremendous and continuous heavy traffic conditions which prevail at this point.

Fortunately no street opening has been made since this pavement was laid and this gives an ideal opportunity for the engineer and layman to make comparisons concerning the exceptional value of improved granite blocks laid under improved specifications which now prevail in the city of New York.

Another very important feature of this particular section of New York city pavement at this popular corner is the fact that, with all of the traffic, it has cost absolutely nothing for upkeep or maintenance, and, in the opinion of several expert city engineers, this particular pavement without disturbance will stand up to those traffic conditions for from fifteen to twenty years with the expenditure of very little, if any, money for maintenance and upkeep, and it is even possible that the life of this pavement may extend to twenty-five or thirty years with practically little maintenance.

ASTOR PLACE, *New York, improved granite block pavement as it appeared on January 13, 1915, indicating the heavy traffic to which it is subjected. John Wanamaker's great department store is on the left.*



HEAVY FLOOD *and consequent washout produced this condition of the small vitrified pipe culvert which was sufficient for all ordinary conditions.*

## A Culvert Hard to Maintain

When the infrequent floods come in California they overstep all bounds and small culverts, sufficient for practically all times, are inadequate while the flood flow continues. Sometimes the overflow causes serious washouts like that shown in one of the accompanying photographs, the friable nature of the soil causing it to crumble rapidly under the action of the rapidly flowing water. The culvert shown in the first view was replaced by that shown in the second, which is of corrugated American ingot iron with concrete protection walls. It is also set lower in the ground, so that the undermining action of the water will not be so serious. Should another flood some time in the future again overflow the road and wash it out, the corrugated iron culvert is expected to keep its shape so that it can be picked up and relaid without requiring new material. This expectation is based on past experience.

## Trade Notes

The Lea-Courtenay Company have opened their own Chicago branch to take care of the increase in their business in turbine and volute pumping machinery. Mr. Maher, formerly of Maher & Byrne Company, agents for the Lea-Courtenay Company, has resigned from the former company to become Chicago manager of the latter.

The Harris patents on electrolytic sewage disposal have been acquired by the John Fuller Engineering Company, 50 Church street, New York, who will give full information regarding the process.

Among the recent contracts awarded the Raymond Concrete Pile Company are 1,579 piles for the foundation of the Schenley High School, Pittsburg, Pa.; foundation for public school No. 5, Jersey City, N. J.; appraisers stores, Milwaukee, Wis.; for the building for the Brett Lithographic Company, Long Island City, N. Y.; for the foundation of power plant for the City Hospital, Cleveland, Ohio; for

CORRUGATED ARMCO INGOT IRON CULVERT *replacing the culvert shown above. If this culvert is washed out it can be picked up and relaid in place. Note concrete head and wing walls protecting the end from wash.*

apartment building on Delaware place and Seneca street, Chicago, Ill.; for standard concrete piles and reinforced concrete footings for the extension to the H. J. Heinz Company warehouse at the Pittsburg plant; for the foundation of the Nurses' Home of the Methodist Episcopal Hospital, Brooklyn, N. Y.

MacArthur Concrete Pile & Foundation Company have been awarded contracts covering concrete pile foundation of the coke bin and coal unloading pocket at the plant of the Philadelphia Suburban Gas & Electric Company, Chester, Pa.; the pile foundation of the Sylvan avenue viaduct, Pittsburg, Pa.; the foundation, including piles and reinforced concrete capping, of the pan house and extension to boiler house at plant of Paterson Parchment Paper Company, Passaic, N. J.; concrete pile foundation of the bridge to be erected over the St. John River between Van Buren, Maine, and St. Leonard, N. B.; concrete piles necessary in connection with the Perry Memorial, Put-in-Bay, Ohio; and the Lynn (Mass.) Gas & Electric Company's new 5,000,000-cubic-foot gas holder.

The Hydraulic Press Brick Company, St. Louis, Mo., is a recent addition to the list of licensees of the Dunn Wire-Cut-Lug Brick Company, Conneaut, Ohio, raising the number to 26 companies, operating 42 plants.

Foreign shipments of motor trucks aggregating in value more than $700,000 have been made by the Kissel Motor Car Company, of Hartford, Wis. Advices received by the company from abroad and from American agents of European governments indicate that even greater business will soon be placed and that Kissel-Kar trucks will be specified in a large portion of it.

The Koehring bar cutter and bar bender are two of the convenient machines for reinforced concrete work supplied by the Koehring Machine Company, Milwaukee, Wis., makers of the famous Koehring line of concrete mixers.

## Trade Publications

A circular of Milwaukee mixers is issued by the Milwaukee Concrete Mixer Company, of which A. L. Tucker, Old Colony Building, Chicago, Ill., is the western district manager.

The use of the pulmotor in the New York subway accident is sketched and illustrated in a circular of The Draeger Oxygen Apparatus Company, Pittsburg, Pa.

The Armco Triangle is a periodical circular issued by the American Rolling Mill Company, Middletown, Ohio, and devoted to American Ingot Iron and its products.

The improved Barnard Castle road and pavement scraper is now made by G. H. Atkinson Company, 30 Church street, New York, who will send information about it.

The Red Book of the U. S. Gypsum Company is full of information on gypsum, its products and how to use them. General offices, 205 West Monroe street, Chicago, Ill.

The Twentieth Century pick-up street sweeper is illustrated and described in a circular of the Baker Manufacturing Company, Springfield, Ill.

The Austin-Western Road Machinery Company, Chicago, Ill., has issued a loose-leaf pocket memorandum book which will be very useful to those who have it, and it can be obtained on application if the name of MUNICIPAL ENGINEERING is mentioned in writing for it. In addition to the pages for memoranda it has a catalog of the ten handsomely illustrated catalogs issued by the company, showing what each catalog contains.

The Pneumatic Placing Company, 45 Broadway, New York, issue frequent circulars regarding the pneumatic method of conveying and placing concrete.

The Heltzel hanging system of concrete road forms is fully described and illustrated in a circular of the Heltzel Steel Form and Iron Works, Warren, Ohio.

Structural Conservation is the title of a monthly devoted to integral waterproofing and edited by the general director of the Truss-Con Laboratories, Detroit, Mich.

The frightfulness of fire, the abhorrence of rats, the health of hogs and the advantages of good roads are the striking subjects portrayed in four new posters issued by the Universal Portland Cement Company. The posters are each 19 by 26 inches, and are sent out carefully enclosed in mailing tubes, upon request to the publicity bureau of the company, Chicago.

Various styles and designs of Studebaker dump wagons are illustrated in circular A 894, which will be sent on request of the Studebaker Company, South Bend, Ind., or at any of their branch houses.

The Sandusky Portland Cement Company, Sandusky, Ohio, have issued a new, handsomely illustrated booklet on Medusa white stainless portland cement, which shows the many uses to which it is put and that it is essential to artistic effects and has therefore been used in many of the most important buildings constructed in recent years thruout the country.

The National Bulletin for February, 1910, shows the increase in the use of steel pipe since 1888 from practically nothing to nearly 2¼ million tons.

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